Biological Assessment Report

Bourbeuse River

Phelps, Gasconade, Crawford, & Franklin Counties, Missouri

Fall 2022 and Spring 2023

Prepared for:

Missouri Department of Natural Resources
Division of Environmental Quality
Water Protection Program
Water Pollution Control Branch

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1.0 Introduction

At the request of the Missouri Department of Natural Resources (**MoDNR**) Water Protection Program (**WPP**), the Environmental Services Program (**ESP**) Water Quality Monitoring Section (**WQMS**) conducted a biological assessment and habitat study of the Bourbeuse River during the fall of 2022 and spring of 2023 (MoDNR 2022a). Fall sampling occurred September 26-29, 2022, and consisted of macroinvertebrate sampling, stream habitat assessments, and water quality sampling. During spring 2023, sampling was conducted from March 13-April 14, 2023, and consisted of macroinvertebrate sampling and water quality sampling. A habitat study of the Meramec River, a biocriteria reference stream, was conducted on October 6, 2022, to compare with Bourbeuse River habitat surveys.

The Bourbeuse River is an extremely sinuous system dominated by long, deep pools connected by short riffles. Water is often turbid due to a lower stream gradient giving rise to its name, which in French means "muddy." The Bourbeuse River is host to a variety of fish and many distinctive mussel species (Blanc 1999; Hinck 2012). Pasture and farmland dominate the landscape and are the primary land uses of the watershed. The Bourbeuse River study reach flows through Phelps, Gasconade, and Franklin counties, with a brief crossing into Crawford County. The Bourbeuse River is categorized as a warm water class "P" stream, maintaining permanent flow even in drought periods. The study reach is approximately 136.7 river miles long with a Water Body Identification (**WBID**) number of 2034. Bourbeuse River WBID 2034 has the following designated uses based on the 2023 water quality standards (**WQS**): drinking water supply, human health protection, irrigation, livestock and wildlife protection, secondary contact recreation, warm water habitat, and whole-body contact recreation Category A (MoDNR 2022f).

The Bourbeuse River watershed has numerous permitted outfalls that may influence stream water quality and aquatic life (Table 1). Major outfalls (i.e. designed discharge ≥ 1 million gallons per day [**MGD**]) include the Cuba Wastewater Treatment Plant (**WWTP**), Sullivan WWTP, Union West WWTP, and St. James WWTP. Along Highway 50 and Interstate 44, various small municipalities border the watershed (Table 1). Roughly 16 miles before joining the Meramec River, the Bourbeuse River flows through the municipality of Union, a Missouri town home to approximately 12,000 residents. Two sizable dams are in the Bourbeuse River study reach. Noser Mill Dam is just upstream of sample site #58.4 and Highway 185. Guth's Mill Dam is located downstream of station #16.2 and upstream of station #6.2 east of Union. These impoundments may lead to the formation of larger pools distinctive to the Bourbeuse River and provide channel grade controls (Blanc 1999).

Table 1: Largest WWTPs in the Bourbeuse Watershed

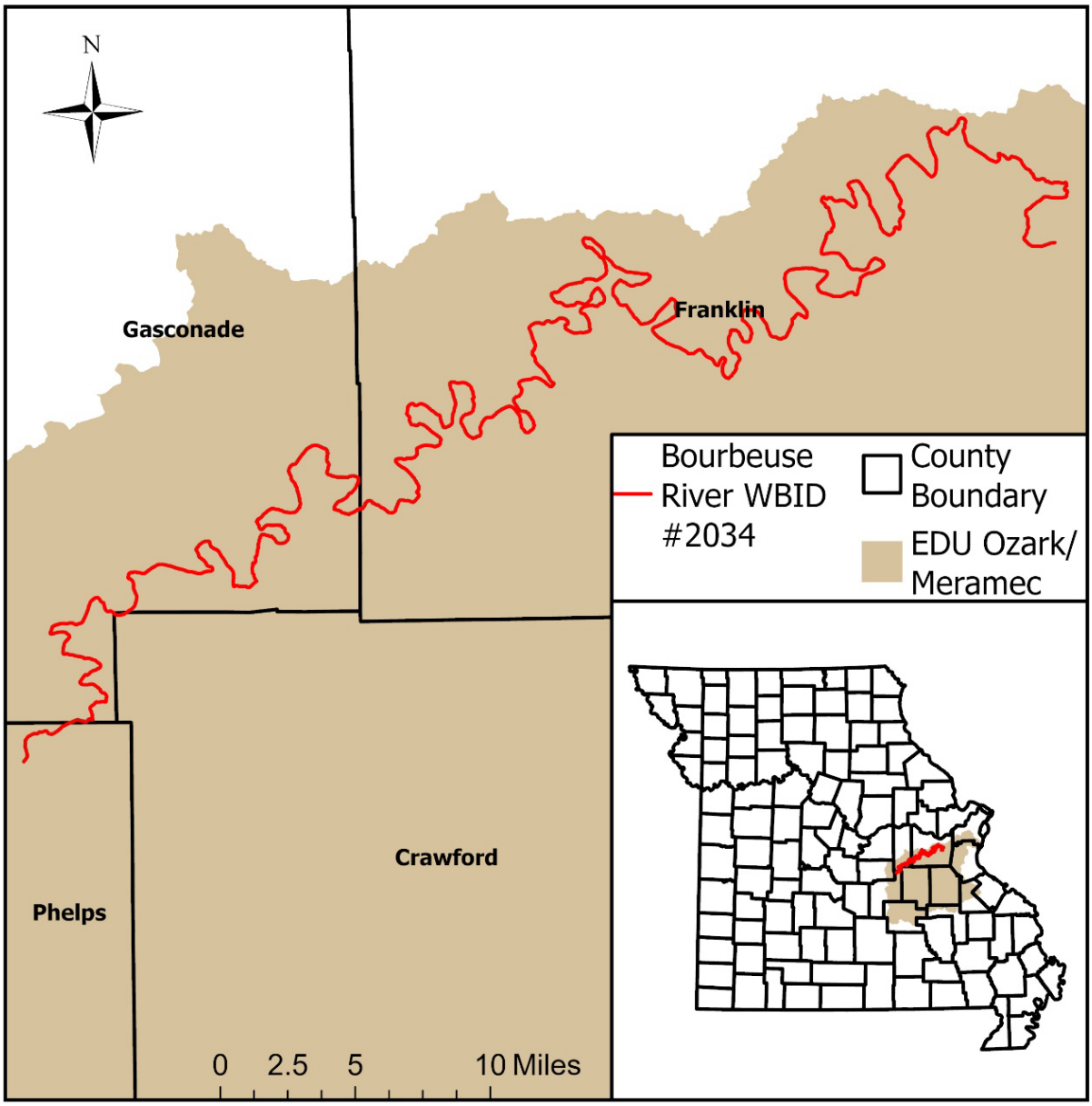
Facility Name	County	MODNR Permit	Design Flow*	Actual Flow*	Receiving Stream
Cuba WWTP	Crawford	MO0094919	1.550	1.250	Pleasant Valley Creek
Sullivan WWTP	Franklin	MO0104736	1.500	1.120	Tributary to Winsel Creek
Union West WWTF	Franklin	MO0025283	1.500	0.939	Bourbeuse River
St. James WWTP	Phelps	MO0093564	1.000	0.662	Robinson Creek
Owensville WWTF	Gasconade	MO0041068	0.600	0.531	Tributary to Red Oak Creek
Bourbon WWTP	Crawford	MO0094765	0.580	0.440	Tributary to Boone Creek
Union East STP	Franklin	MO0121312	0.800	0.185	Tributary to Bourbeuse River

* Million Gallons per Day (MGD)

1.1 Study Area

The Bourbeuse River is within the Ozark/Meramec Ecological Drainage Unit (**EDU**). An EDU can be defined as a region that contains similar biological communities and habitat conditions. The Bourbeuse River was assessed by comparing macroinvertebrate community data to that of Ozark/Meramec EDU wadeable/perennial biological criteria reference (**BIOREF**) streams (Figure 1).

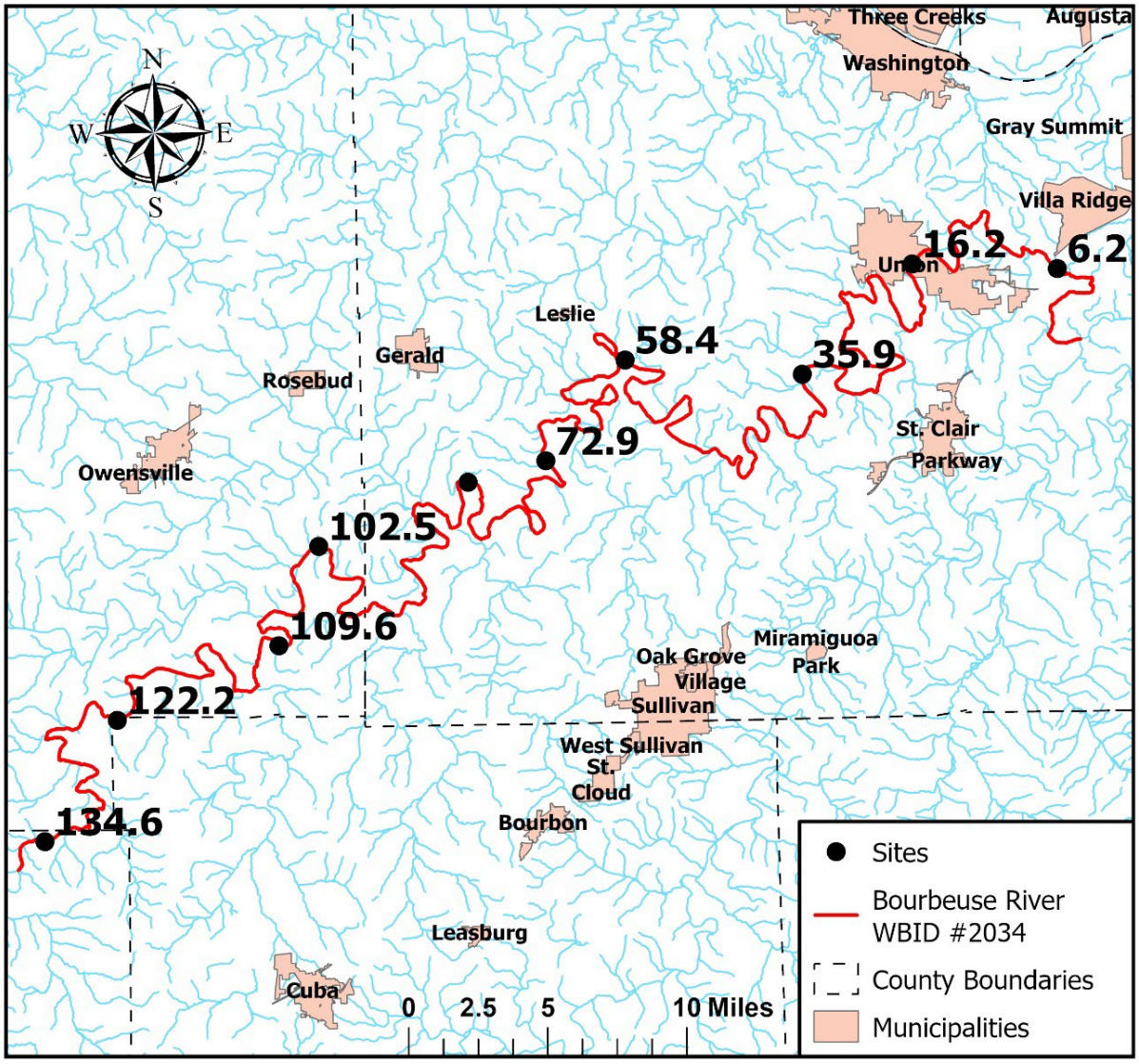
Figure 1: Locations of the study stream within the Ozark/Meramec EDU



1.2 Station Descriptions

Ten Bourbeuse River stations were sampled for this project. Their numerical descriptions are derived from the distance upstream (i.e. river miles) from the WBID downstream termination point. The following locations and descriptions correspond with the station labels in Figure 2 and 3. Station locations were recorded as Universal Transverse Mercator (**UTM**) coordinates. All sites were in Zone 15.

Figure 2: Bourbeuse River sample sites with surrounding municipalities



Bourbeuse River Station 2034/134.6 was sampled upstream and downstream of State Highway B in Phelps County. UTM coordinates were collected at the midpoint of the sample reach and are E624388, N4223062.

Bourbeuse River Station 2034/122.2 was sampled downstream of the State Highway EE bridge near the Missouri Department of Conservation (**MDC**) Mint Spring Access in Crawford and Gasconade counties. UTM coordinates were taken at the upstream boundary of the sample reach and are E628436, N4230109.

Bourbeuse River Station 2034/109.6 was sampled downstream of the Hog Trough Road bridge in Gasconade County. UTM coordinates were taken at the upstream boundary of the sample reach and are E637911, N4234454.

Bourbeuse River Station 2034/102.5 was sampled downstream of the State Highway T bridge near the MDC Tea Access in Gasconade County. UTM coordinates were taken at the upstream boundary of the sample reach and are E640150, N4240190.

Bourbeuse River Station 2034/84.1 was sampled downstream of Mill Rock Road near the MDC Mill Rock Access in Franklin County. UTM coordinates were taken at the upstream boundary of the sample reach and are E648383, N4243924.

Bourbeuse River Station 2034/72.9 was sampled upstream of West Laubinger Ford in Franklin County. UTM coordinates were taken at the downstream boundary of the sample reach and are E653433, N4245059.

Bourbeuse River Station 2034/58.4 was sampled upstream and downstream of Highway 185 in Franklin County. UTM coordinates were taken at the upper boundary of the sample reach and are E657982, N4250910.

Bourbeuse River Station 2034/35.9 was sampled downstream of Reiker Ford Road near the MDC Reiker Ford Access in Franklin County. UTM coordinates were taken at the midpoint of the sample reach and are E668330, N4249699.

Bourbeuse River Station 2034/16.2 was sampled upstream of Highway 50 and the Union WWTP outfall near the MDC Union Access in Franklin County. UTM coordinates were taken at the downstream boundary of the sample reach and are E674616, N4256580.

Bourbeuse River Station 2034/6.2 was sampled downstream of Interstate 44 near the MDC Uhlemeyer Access in Franklin County. UTM coordinates were taken at the upstream boundary of the sample reach and are E682874, N4256450.

2.0 Methods

Macroinvertebrate and water quality sampling was conducted during fall 2022 and spring 2023 by WQMS's Aquatic Bioassessment Unit. Methods for stream habitat assessments, biological assessments, and physicochemical water quality are included in this section. All samples were handled according to the appropriate MoDNR ESP Standard Operating Procedure (**SOP**) or Project Procedure (**PP**).

2.1 Stream Habitat

Stream habitat is a foundational filter for aquatic communities and as such determines which species can be supported. Stream habitat was assessed using procedures for riffle/pool streams as described in the *Stream Habitat Assessment Project Procedure* (**SHAPP**, MoDNR 2019e). The total habitat score equaled the sum of scores for each of 10 habitat measures assessed along 10 separate sections of the stream reach. A stream reach was defined as 20 times the average width of the stream. Bourbeuse River habitat scores were compared to a BIOREF habitat score of the Meramec River at Short Bend MDC access at Highway 19. Study stream habitat scores that are ≥75% of reference stream scores should be able to support biological communities comparable to the reference stream (MoDNR 2019e).

2.2 Stream Physicochemistry

Physicochemical water samples were handled according to the appropriate MoDNR ESP SOPs. Results for physicochemical water parameters were examined by season and station by *in-situ* field measurements or grab samples collected in accordance with SOP MDNR-ESP-001, *Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations* (MoDNR 2021a). All samples were kept on ice during transport to ESP.

Water quality parameters were measured *in-situ* or samples were collected and submitted for analyses at the ESP laboratory in Jefferson City. Conductivity (µS/cm, MoDNR 2018), discharge (cubic feet per second-cfs, MoDNR 2020), dissolved oxygen (mg/L, MoDNR 2019b), pH (MoDNR 2022b), temperature (°C, MoDNR 2022c), and turbidity (FNU, MoDNR 2021b), were measured in the field. The ESP Chemical Analysis Section conducted analyses for the following: nitrate plus nitrite as nitrogen (**NO_3+NO_2-N)**, total nitrogen, ammonia as nitrogen, total phosphorus, sulfate, chloride, total suspended solids/non-filterable reside, dissolved calcium, and dissolved magnesium (all parameters reported in mg/L). Physicochemical water parameters were compared among stations as well as with Missouri's WQS (MoDNR 2022f). Nutrient values were compared to U.S. EPA's recommended nutrient values for rivers and streams in nutrient ecoregion XI (USEPA 2000).

2.3 Bioassessment

Macroinvertebrate sampling was conducted according to the *Semi-quantitative Macroinvertebrate Stream Bioassessment Project Procedure* (**SMSBPP**, MoDNR 2019a). The Bourbeuse River is considered a riffle/pool dominated system. The three standard habitats sampled at all locations were flowing water over coarse substrate, non-flowing water over depositional substrate, and submerged rootmat. Macroinvertebrate samples were subsampled in the laboratory and identified to taxonomic levels specified in MoDNR's *Taxonomic Levels for*

Macroinvertebrate Identifications SOP (MoDNR 2022d) to develop biological metrics (MoDNR 2019a). Macroinvertebrate bench sheet data are included in Appendix A.

Bourbeuse River macroinvertebrate data were evaluated relative to BIOREF streams in the Ozark/Meramec EDU (MDNR 2002; Appendix B). Biological criteria are calculated separately for the fall (mid-September through mid-October) and spring (mid-March through mid-April) index periods. The SMSBPP provides details on the calculation of metrics and scoring of the multi-metric Macroinvertebrate Stream Condition Index (**MSCI**). The four components of the MSCI are: Taxa Richness (**TR**); Ephemeroptera, Plecoptera, and Trichoptera Taxa (**EPTT**); Biotic Index (**BI**); and the Shannon Diversity Index (**SDI**). An MSCI score of 16-20 is considered fully supporting, 10-14 partially supporting, and 4-8 is non-supporting of the protection of warm water aquatic habitat beneficial use designation as listed in the Missouri WQS (MoDNR 2022f).

2.4 Quality Assurance/Quality Control (QA/QC) of Bioassessment Data

2.4.1 Data Collection

Data were collected following guidelines in *Quality Assurance/Quality Control for Environmental Data Collection* (MoDNR 2019c).

2.4.2 Meter Calibration

Field meters necessary for the collection of temperature, turbidity, dissolved oxygen, pH, specific conductance, and discharge were maintained in accordance with *Quality Control Procedures for Checking Water Quality Field Instruments* (MoDNR 2022e).

2.4.3 Macroinvertebrate Subsampling

Macroinvertebrates from collected samples were checked for accuracy using methods in the SMSBPP (MoDNR 2019a).

2.4.4 Macroinvertebrate Data Entry

Macroinvertebrate data were entered into the WQMS macroinvertebrate database in accordance with *Quality Control Procedures for Data Processing* (MoDNR 2019d).

2.5.5 Duplicate Sample Collection

Duplicate samples are obtained from the same location and time as the true sample following the same procedures in accordance with *Quality Assurance/Quality Control for Environmental Data Collection* (MoDNR 2019c). True samples and duplicate samples are analyzed for the same set of parameters. A duplicate sample is used to assess the precision associated with sampling methodology, sample heterogeneity, and analytical procedures (MoDNR 2019c). Duplicate Bourbeuse River physicochemical samples were collected at station #58.4 during fall 2022 and station #109.6 during spring 2023.

3.0 Bioassessment Results

3.1 Land Cover

The overall land cover of the Bourbeuse River drainage is shown in Figure 3. Table 2 shows the land cover percentages for each of the Bourbeuse River stations and the Ozark/Meramec EDU. All stations, including the habitat survey reference station, are dominated by deciduous forest and hay/pasture. These data are derived from 2021 National Land Cover Database (**NLCD**) imaging (Dewitz 2021).

Figure 3: Land use of the Bourbeuse River watershed

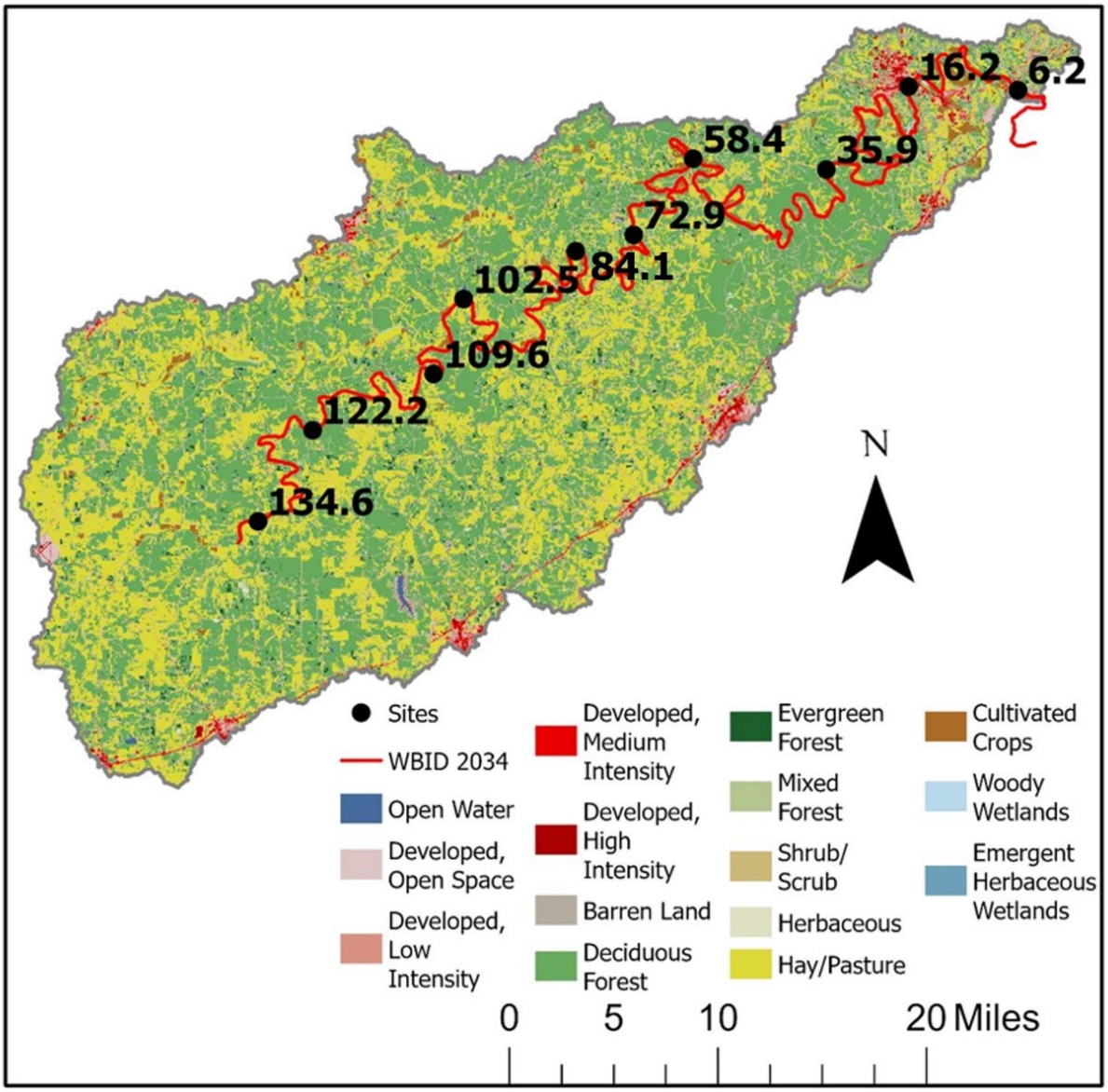


Table 2: Percent Land use of Bourbeuse River station watersheds and Ozark/Meramec EDU

	134.6	**122.2**	**109.6**	**102.5**	**84.1**	**72.9**	**58.4**	**35.9**	**16.2**	**6.2**	**EDU**
Barren Land	0.08	0.07	0.15	0.12	0.12	0.11	0.11	0.10	0.11	0.13	0.27
Cultivated Crops	0.63	0.53	0.49	0.91	1.22	1.23	1.41	1.44	1.58	1.93	1.07
Deciduous Forest	43.57	45.41	46.11	46.09	46.08	45.02	45.47	46.77	46.43	45.48	56.77
Developed, High Intensity	0.30	0.23	0.24	0.19	0.18	0.18	0.18	0.22	0.29	0.31	0.40
Developed, Low Intensity	1.86	1.56	1.84	1.64	1.66	1.69	1.69	1.85	2.06	2.25	2.65
Developed, Medium Intensity	1.00	0.79	0.86	0.70	0.70	0.72	0.69	0.80	0.96	1.08	1.24
Developed, Open Space	3.84	3.71	3.93	4.01	3.94	3.98	3.97	4.09	4.16	4.28	4.58
Emergent Herbaceous Wetlands	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.06	0.08	0.08	0.10
Evergreen Forest	1.88	1.75	1.77	1.65	1.61	1.63	1.67	1.55	1.53	1.53	2.48
Hay/Pasture	39.99	39.10	36.91	37.47	36.73	37.35	36.24	34.61	33.77	33.40	20.67
Herbaceous	0.68	0.65	0.61	0.52	0.54	0.53	0.54	0.57	0.57	0.57	0.78
Mixed Forest	4.77	4.83	5.43	5.06	5.57	5.94	6.41	6.43	6.90	7.36	6.84
Open Water	0.61	0.55	0.76	0.70	0.72	0.72	0.74	0.70	0.72	0.73	0.72
Shrub/Scrub	0.72	0.70	0.69	0.70	0.69	0.67	0.65	0.63	0.62	0.62	0.92
Woody Wetlands	0.06	0.10	0.18	0.21	0.20	0.19	0.20	0.20	0.22	0.24	0.50

3.2 Stream Habitat

Habitat assessment scoring results are found in Table 3. If the study station SHAPP score is ≥75% of the control station score, the stations are considered to contain habitats comparable to the control station (MoDNR 2019e). Comparable habitats should support similar biological communities. For this project, the Meramec River at MDC's Short Bend Access was used as the habitat control station. All Bourbeuse River stations scored ≥75% of the habitat control stream SHAPP score. Bourbeuse River habitat consisted of long, deep pools connected by short riffles flowing adjacent to gravel bars. Banks were high and steep, but they appeared to be relatively stable despite having little vegetative protection. Riparian zones generally had adequate width and consisted of lowland forest habitat.

Table 3: Bourbeuse River and Meramec River reference stream habitat assessment values and scores

Stream Habitat Parameters	**134.6**	**122.2**	**109.6**	**102.5**	**84.1**	**72.9**	**58.1**	**35.9**	**16.2**	**6.2**	**Control**
Habitat Assessment Date	9/26/22	9/26/22	9/26/22	9/27/22	9/28/22	9/27/22	9/28/22	9/28/22	9/29/22	9/29/22	10/16/22
Epifaunal Substrate/Available Cover	17	19	15	16	16	17	17	17	15	16	17
Embeddedness	18	19	16	19	17	17	16	16	14	16	16
Velocity/Depth Regime	15	15	15	15	18	14	18	20	16	20	16
Sediment Deposition	10	12	6	10	11	12	13	12	8	8	10
Channel Flow Status	10	8	12	13	15	13	12	14	14	15	12
Channel Alteration	14	20	20	17	20	20	13	18	20	20	20
Riffle Quality	12	15	13	11	15	11	17	18	7	16	13
Left Bank Stability	10	10	10	10	10	9	10	10	8	5	6
Right Bank Stability	8	8	7	10	9	10	10	5	9	9	10
Left Bank Vegetative Protection	2	2	4	3	3	4	4	4	1	2	2
Right Bank Vegetative Protection	2	2	2	1	1	2	1	1	5	2	3
Left Bank Riparian Zone Width	6	7	10	10	10	9	10	10	10	9	9
Right Bank Riparian Zone Width	10	10	9	9	10	10	10	10	8	10	10
Total Habitat Score	**134**	**147**	**139**	**144**	**155**	**148**	**151**	**155**	**135**	**148**	**144**
% of BIOREF	**93**	**102**	**97**	**100**	**108**	**103**	**105**	**108**	**94**	**103**	**-**

3.3 Physicochemical Analysis

Results for Bourbeuse River physicochemical samples and *in-situ* water quality measurements are presented in Table 4 and Table 5. No WQS violations occurred during fall 2022 or spring 2023 collection (MoDNR 2022f).

During sample collection, there were no nutrient criteria in place for Missouri streams and rivers so Bourbeuse River nutrient parameters were compared to the U.S. EPA's *Ambient Water Quality Criteria Recommendations for Rivers and Streams in Nutrient Ecoregion XI* (USEPA 2000). Bourbeuse River study stations are located in the Ozark Highlands Level III ecoregion. At the Level IV ecoregion extent, the sample reach occupies the Central Plateau, a region containing divided small plateaus in a mostly cleared area used for pasture and farmland (Chapman et al. 2002). The recommended values for the Ozark Highlands (i.e. level III ecoregion #39) are: 0.239 mg/L NO_3 + NO_2; 0.379 mg/L total nitrogen; 6.625 µg/L total phosphorus; and 1.425 NTU turbidity (USEPA 2000).

In fall 2022, Bourbeuse River station #6.2 exceeded EPA's recommended value for NO_2 + NO_3, and all stations exceeded the recommended value for total phosphorus (Table 4). In spring 2023, Bourbeuse River stations #134.6, 122.2, and 109.6 exceeded EPA's recommend value for NO_3 + NO_2 (Table 5). Stations #134.6, 122.2, 109.6, and 84.1 exceeded EPA's recommended value for total nitrogen, and all stations exceeded total phosphorus EPA recommended values in spring 2023 (Table 5).

Table 4: Physicochemical and nutrient data in the Bourbeuse River during the Fall 2022

Bourbeuse River Stations	134.6	122.2	109.6	102.5	84.1	72.9	58.4	58.4 DUP	35.9	16.2	6.2
Date	9/26/22	9/26/22	9/26/22	9/27/22	9/28/22	9/27/22	9/28/22	9/28/22	9/28/22	9/29/22	9/29/22
	In situ Field Measurements										
Dissolved Oxygen (mg/L)	6.90	7.56	8.61	8.02	8.92	8.96	9.15	9.14	9.86	8.79	9.40
Flow (cfs)	0.80	2.49	4.86	5.59	9.89	13.85	14.12	14.41	38.44	41.87	49.03
Conductivity (µS/cm)	402.4	390.5	405.4	348.2	369.7	353.9	337.4	337.4	373.5	348.0	366.4
Temperature (°C)	19.3	19.6	20.9	17.2	17.7	20.5	20.4	20.4	18.6	16.1	17.9
Turbidity (FNU)	1.5	3.7	3.3	2.6	3.4	4.9	2.6	2.6	2.8	4.3	6.0
pH (standard units)	7.38	7.58	7.75	7.59	7.83	7.89	7.41	7.41	8.1	7.62	7.86
	Laboratory Analysis										
Ammonia (mg/L)	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND
Calcium (mg/L)	28.8	27.5	30.2	24.7	27.9	26.3	24.5	24.6	32.2	31.7	32.1
Chloride (mg/L)	16.0	15.3	13.6	12.6	10.6	8.71	7.37	7.30	8.60	8.58	13.40
Hardness (mg/L)	159	160	169	146	161	156	151	152	172	174	175
Magnesium (mg/L)	21.2	22.1	22.8	20.5	22.2	21.8	21.8	21.9	22.4	23.0	23.0
Nitrate + Nitrite (mg/L)	0.013	<0.008 ND	<0.008 ND	0.020	<0.008 ND	<0.008 ND	<0.008 ND	0.010	0.016	0.104	**0.384**
Sulfate (mg/L)	33.3	31.1	25.4	23.1	25.9	24.4	22.6	22.4	15.1	13.7	14.6
Total Phosphorus (mg/L)	**0.31**	**0.28**	**0.26**	**0.38**	**0.26**	**0.28**	**0.27**	**0.26**	**0.21**	**0.34**	**0.67**
Total Nitrogen (mg/L)	0.022	0.070	0.029	0.020	0.022	0.023	0.021	0.020	0.019	0.027	0.13
Total Suspended Solids (mg/L)	<5 ND	<5 ND	<5 ND	<5 ND	<5 ND	5	<5 ND	<5 ND	<5 ND	6	7

Qualifiers are ND - Not detected at reported value. Bold values exceed EPA's recommended values for Rivers and Streams in Nutrient Ecoregion XI.

Table 5: Physicochemical and nutrient data in the Bourbeuse River during the Spring 2023

Bourbeuse River Stations	134.6	122.2	109.6	109.6 DUP	102.5	84.1	72.9	58.4	35.9	16.2	6.2
Date	3/13/23	3/13/23	3/14/23	3/14/23	4/12/23	4/12/23		4/14/23	4/12/23		4/14/23
	In situ Field Measurements										
Dissolved Oxygen (mg/L)	11.90	12.02	11.76	11.76	10.14	10.47		9.49	11.39		10.45
Flow (cfs)	109.69	123.38	188.82	195.67	147.44	201.56		202.55	313.67		337*
Conductivity (µS/cm)	248.7	234.8	221.5	221.5	203.5	205.6		219.6	208.1		234.8
Temperature (°C)	5.0	6.2	5.1	5.1	15.9	16.1		18.2	17.7		18.5
Turbidity (FNU)	5.0	5.4	5.7	5.7	3.7	6.6		6.8	9.6		6.4
pH (standard units)	7.09	7.46	7.40	7.40	7.56	7.66		7.68	8.08		8.13
	Lab Analysis										
Ammonia (mg/L)	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND	<0.02 ND		<0.02 ND	<0.02 ND		<0.02 ND
Calcium (mg/L)	20.3	19.5	19.6	19.5	19.5	20.0		19.2	20.8		21.5
Chloride (mg/L)	7.19	6.15	6.21	6.50	5.73	6.01		5.88	6.18		7.67
Hardness (mg/L)	106	101	100	101	99.4	101		97.5	104		105
Magnesium (mg/L)	13.4	12.6	12.5	12.7	12.3	12.4		12.1	12.6		12.5
Nitrate + Nitrite (mg/L)	**0.367**	**0.354**	**0.373**	**0.374**	0.040	0.025		<0.008 ND	0.074		0.031
Sulfate (mg/L)	27.8	26.2	23.9	24.2	16.8	15.6		16.2	14.1		13.8
Total Phosphorus (mg/L)	**0.033**	**0.028**	**0.032**	**0.037**	**0.030**	**0.036**		**0.039**	**0.048**		**0.044**
Total Nitrogen (mg/L)	**0.52**	**0.51**	**0.54**	**0.53**	0.32	**0.42**		0.29	**0.37**		0.36
Total Suspended Solids (mg/L)	<5 06; ND	<5 06; ND	<5 06; ND	<5 06; ND	<5 ND	8 06		<5 ND	8 06		8 06

Qualifiers are ND - not detected at reported value; 06 – estimated value, QC data outside limits. Bold values exceed EPA's recommended values for Rivers and Streams in Nutrient Ecoregion XI.
*Flow measurement reported from USGS gage #07016500 at Union, MO.

3.4 Biological Assessment

3.4.1 Macroinvertebrate Community Composition

Fall 2022

Bourbeuse River fall 2022 samples generally had high percentages of EPTT at most stations. Ephemeroptera were present in high abundance, making up between 17.40% to 49.74% of samples (Table 6). Trichoptera abundance varied among stations from being scarce at station #16.2 (5.44%) to comprising a large percentage of invertebrates at station #35.9 (30.93%). Of EPT orders, Plecoptera was the least abundant group in the Bourbeuse River. The Diptera family Chironomidae was among the top five families at all Bourbeuse River stations. They were especially abundant at #122.2, where chironomids made up almost half of the sample. Riffle beetles (Elmidae) were among the top five families at all Bourbeuse River stations. Mayflies in the family Leptohyphidae were also present in the top five families in the Bourbeuse River, excluding station #72.9 (Table 6).

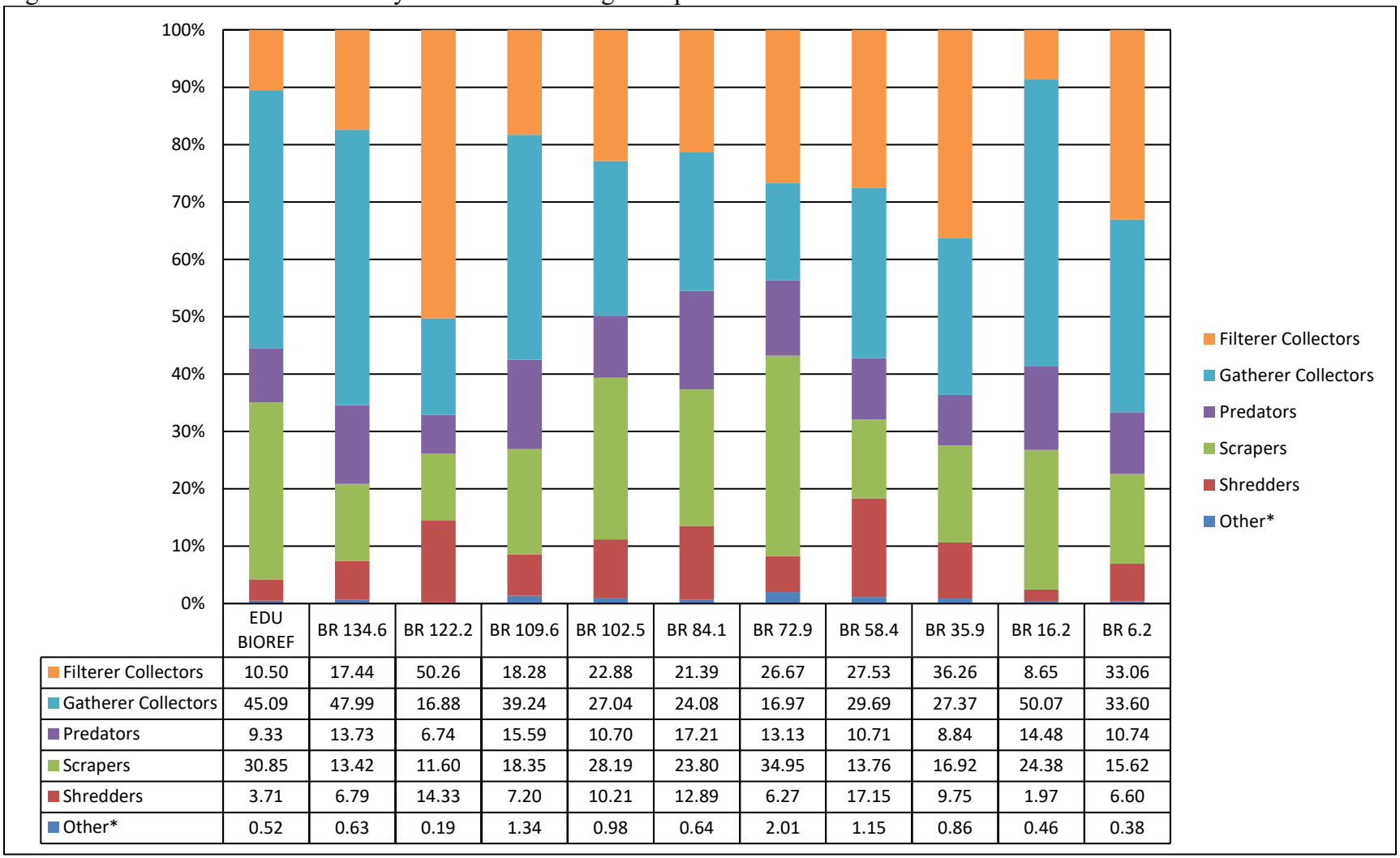
Fall 2022 functional feeding groups (**FFG**) were primarily composed of filterer-collectors, gatherer-collectors, and scrapers (Figure 4). The Bourbeuse River maintained relatively similar percentages of FFGs among sites, with the exceptions of stations #122.2 and 16.2 (Figure 4). Because of the high number of Chironomidae at station #122.2, filterer-collectors represented over half of invertebrates at that site (Figure 4). Gatherer-collectors made up 50.07% of the station #16.2 sample (Figure 4). With respect to sensitivity, during fall 2022, all Bourbeuse River stations contained mostly invertebrates in the moderately tolerant range (i.e. BI 5.0 – 7.4; Figure 5).

Table 6: Fall 2022 Bourbeuse River Riffle/Pool Macroinvertebrate Composition

Bourbeuse River Stations	BIOREF	134.6	122.2	109.6	102.5	84.1	72.9	58.4	35.9	16.2	6.2
Collection Date	-	9/26/22	9/26/22	9/26/22	9/27/22	9/28/22	9/27/22	9/28/22	9/28/22	9/28/22	9/29/22
Taxa Richness	85	100	85	85	88	95	76	85	86	88	101
Number EPTT	26	25	20	33	27	33	28	27	31	31	33
% Ephemeroptera	49.57	35.67	17.40	26.27	24.35	22.52	33.19	28.00	25.92	49.74	33.44
% Plecoptera	0.21	1.26	2.51	4.67	4.90	6.87	0.75	0.95	2.86	0.21	0.81
% Trichoptera	4.87	6.55	17.59	17.01	12.42	14.38	15.64	20.27	30.93	5.44	24.48
MSCI Score	-	18	14	20	20	20	16	18	18	18	18
% Dominant Families											
Chironomidae	**11.18**	**20.52**	**48.35**	**18.99**	**29.66**	**27.69**	**30.18**	**30.10**	**18.86**	**10.22**	**21.85**
Leptohyphidae	**16.51**	**16.18**	**9.24**	**18.20**	**7.92**	**10.84**	2.68	**17.97**	**16.27**	**36.70**	**18.95**
Caenidae	**12.00**	**9.63**	2.17	1.90	1.55	1.06	2.01	1.15	0.81	0.46	0.81
Hyalellidae	2.88	**7.02**	0.41	3.32	2.12	0.92	0.17	0.88	0.43	0.26	0.48
Elmidae	**14.06**	**5.68**	**7.86**	**16.30**	**15.36**	**18.41**	**11.96**	**10.64**	**15.36**	**17.04**	**10.36**
Heptageniidae	**14.18**	3.24	**3.14**	2.53	**13.07**	5.24	**22.74**	1.83	2.91	**5.31**	4.99
Hydropsychidae	1.25	3.00	**14.71**	**4.91**	4.25	**5.45**	**7.27**	**12.27**	**15.95**	2.29	0.75
Leptoceridae	2.22	2.13	4.98	**4.91**	**4.98**	4.67	**5.35**	**3.93**	3.13	1.90	**16.10**
Perlidae	**0.20**	1.26	2.51	4.67	4.90	**6.87**	0.75	0.95	2.86	3.67	0.81
Baetidae	1.72	2.21	0.82	2.61	0.82	1.63	1.09	1.42	1.62	**3.93**	4.62
Philopotamidae	0.03	1.03	1..42	**4.91**	1.06	3.82	1.09	2.92	**10.83**	**10.83**	**6.60**

Top five families in bold. Average values presented for the BIOREF column (n = 10).

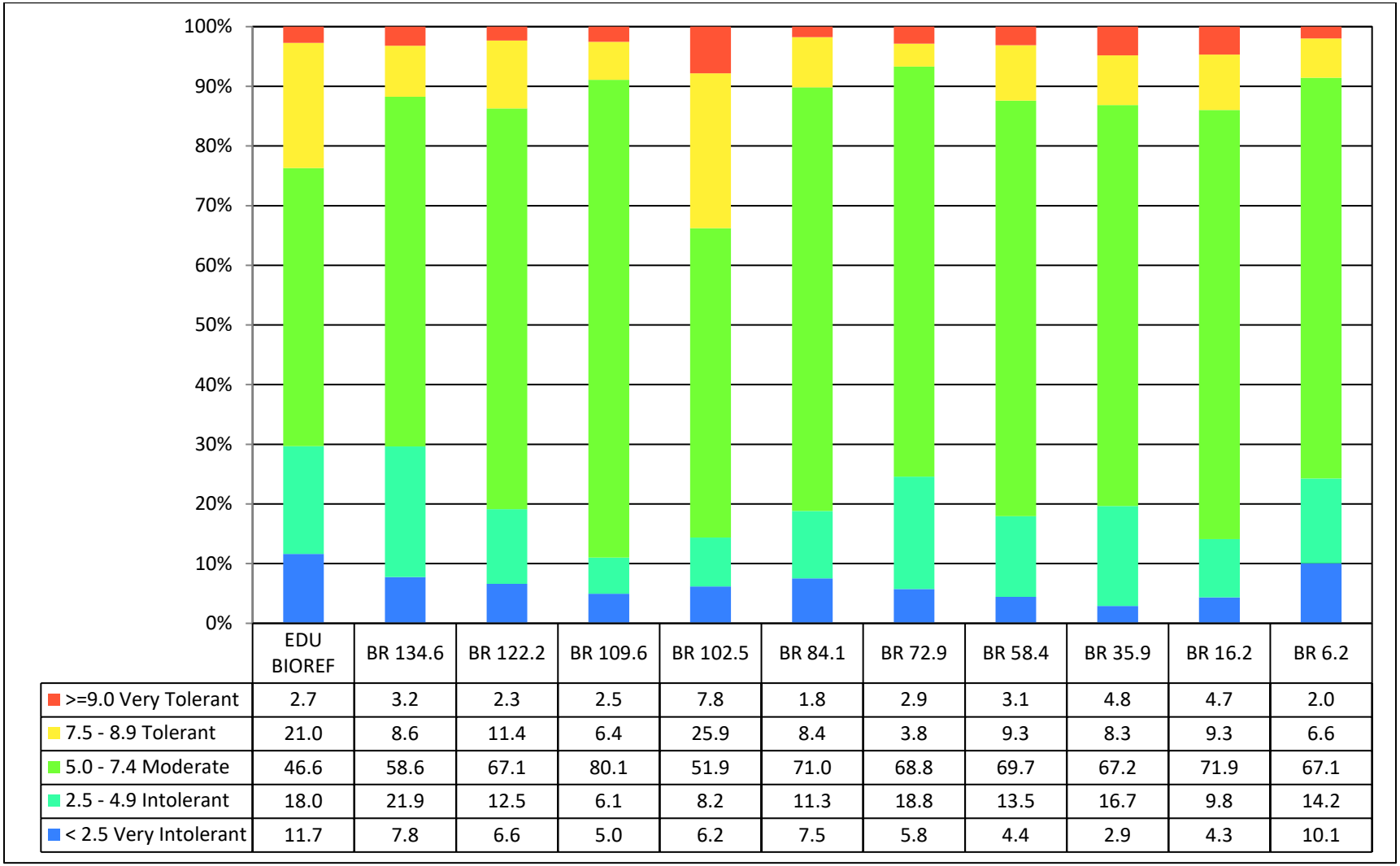
Figure 4: Fall 2022 Percent of Taxa by Functional Feeding Group



	EDU BIOREF	BR 134.6	BR 122.2	BR 109.6	BR 102.5	BR 84.1	BR 72.9	BR 58.4	BR 35.9	BR 16.2	BR 6.2
Filterer Collectors	10.50	17.44	50.26	18.28	22.88	21.39	26.67	27.53	36.26	8.65	33.06
Gatherer Collectors	45.09	47.99	16.88	39.24	27.04	24.08	16.97	29.69	27.37	50.07	33.60
Predators	9.33	13.73	6.74	15.59	10.70	17.21	13.13	10.71	8.84	14.48	10.74
Scrapers	30.85	13.42	11.60	18.35	28.19	23.80	34.95	13.76	16.92	24.38	15.62
Shredders	3.71	6.79	14.33	7.20	10.21	12.89	6.27	17.15	9.75	1.97	6.60
Other*	0.52	0.63	0.19	1.34	0.98	0.64	2.01	1.15	0.86	0.46	0.38

* Other includes parasites, macrophyte piercers, and taxa with no identified FFG.

Figure 5: Fall 2022 Percent Sensitive Taxa by Biotic Index



	EDU BIOREF	BR 134.6	BR 122.2	BR 109.6	BR 102.5	BR 84.1	BR 72.9	BR 58.4	BR 35.9	BR 16.2	BR 6.2
>=9.0 Very Tolerant	2.7	3.2	2.3	2.5	7.8	1.8	2.9	3.1	4.8	4.7	2.0
7.5 - 8.9 Tolerant	21.0	8.6	11.4	6.4	25.9	8.4	3.8	9.3	8.3	9.3	6.6
5.0 - 7.4 Moderate	46.6	58.6	67.1	80.1	51.9	71.0	68.8	69.7	67.2	71.9	67.1
2.5 - 4.9 Intolerant	18.0	21.9	12.5	6.1	8.2	11.3	18.8	13.5	16.7	9.8	14.2
< 2.5 Very Intolerant	11.7	7.8	6.6	5.0	6.2	7.5	5.8	4.4	2.9	4.3	10.1

Spring 2023

During spring 2023, the Bourbeuse River had much lower EPTT abundance. Ephemeroptera made up from 4.50% to 14.21% of samples (Table 7). This range is notably lower than the fall season (i.e. 17.40% – 49.74%) and spring BIOREF samples (34.65%). Trichoptera abundance was also diminished from fall 2022 but remained closer to BIOREF values. Similar to fall 2022, there were few Plecoptera found in spring 2023 Bourbeuse River samples, but they were more abundant than in BIOREF samples (Table 7). In all Bourbeuse River sample sites, Chironomidae and Elmidae were in the top five families. The family Chironomidae was especially dominant, making up between 27.42% and 52.62% of samples.

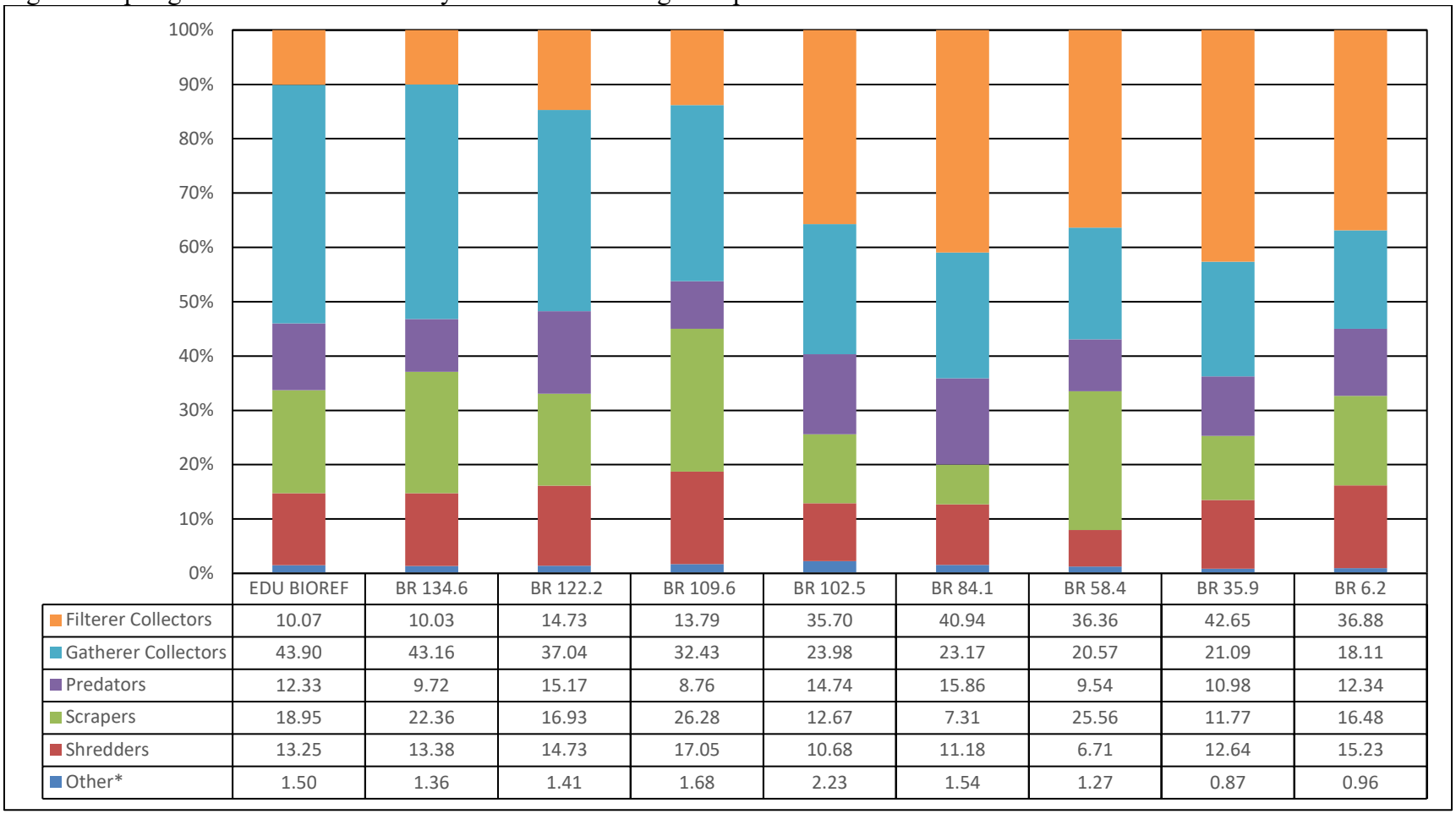
Spring 2023 FFGs were mostly filterer-collectors, gatherer-collectors, and scrapers (Figure 6). There was a slight FFG shift from upstream to downstream through the reach. Gatherer-collectors were more abundant at upstream stations, and filterer-collectors were more dominant at downstream stations (Figure 6). Macroinvertebrates in the moderately tolerant category (i.e. BI 5.0 – 7.4) were highly represented in spring 2023 Bourbeuse River samples. There was a slightly higher percentage of intolerant taxa (BI 2.5 – 4.9) in spring compared to fall 2022 samples (Figures 5 and 7).

Table 7: Spring 2023 Bourbeuse River Riffle/Pool Macroinvertebrate Composition

Bourbeuse River Stations	BIOREF	134.6	122.2	109.6	102.5	84.1	72.9	58.4	35.9	16.2	6.2
Collection Date	-	3/13/23	3/13/23	3/14/23	4/12/23	4/12/23	NA	4/14/23	4/12/23	NA	4/14/23
Taxa Richness	100	94	131	115	88	106		89	101		88
Number EPTT	33	26	38	33	23	34		21	27		23
% Ephemeroptera	34.65	14.21	15.61	10.90	8.53	10.38		6.41	4.50		7.76
% Plecoptera	1.94	3.66	6.61	3.08	4.78	8.55		5.37	4.50		3.33
% Trichoptera	4.92	2.30	4.67	4.10	5.34	2.19		3.20	3.24		3.84
MSCI Score	-	16	20	18	14	18		14	16		14
% Dominant Families											
Chironomidae	**34.68**	**43.05**	**41.62**	**42.03**	**36.81**	**32.68**		**27.42**	**36.49**		**52.62**
Simuliidae	0.35	3.03	**6.70**	1.77	**24.62**	**31.43**		**26.53**	**30.65**		**11.38**
Elmidae	**9.44**	**7.94**	**7.85**	**18.36**	**9.88**	**4.97**		**22.95**	**9.79**		**14.63**
Perlidae	0.80	2.19	5.03	2.24	**4.46**	**7.60**		**5.37**	**4.27**		**3.25**
Leptohyphidae	**6.31**	1.99	1.32	1.58	**3.67**	1.61		**3.35**	1.42		**4.43**
Caenidae	**11.37**	**5.75**	**5.73**	**4.29**	2.47	2.63		0.45	0.08		0.37
Heptageniidae	**7.83**	**4.18**	**6.17**	**3.17**	1.04	1.54		1.86	1.34		1.63
Naididae	0.65	**7.11**	1.59	**5.50**	0.96	2.78		2.76	**3.55**		1.18
Baetidae	0.35	1.25	0.97	0.28	0.96	**4.09**		0.22	0.79		0.37

Top five families in bold. Average values presented for the BIOREF column (n = 8).

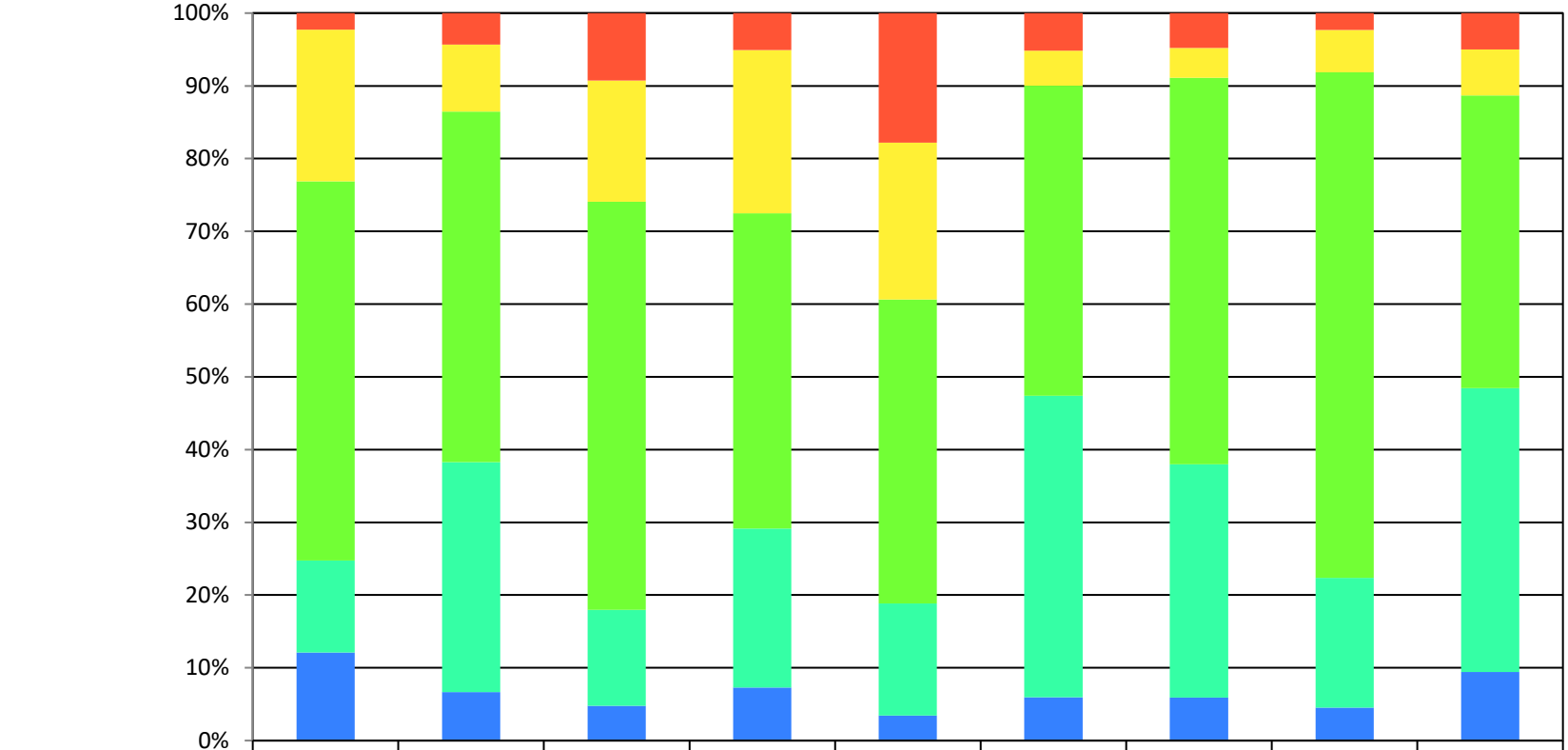
Figure 6: Spring 2023 Percent of Taxa by Functional Feeding Group



	EDU BIOREF	BR 134.6	BR 122.2	BR 109.6	BR 102.5	BR 84.1	BR 58.4	BR 35.9	BR 6.2
Filterer Collectors	10.07	10.03	14.73	13.79	35.70	40.94	36.36	42.65	36.88
Gatherer Collectors	43.90	43.16	37.04	32.43	23.98	23.17	20.57	21.09	18.11
Predators	12.33	9.72	15.17	8.76	14.74	15.86	9.54	10.98	12.34
Scrapers	18.95	22.36	16.93	26.28	12.67	7.31	25.56	11.77	16.48
Shredders	13.25	13.38	14.73	17.05	10.68	11.18	6.71	12.64	15.23
Other*	1.50	1.36	1.41	1.68	2.23	1.54	1.27	0.87	0.96

*Other includes parasites, macrophyte piercers, and taxa with no identified FFG

Figure 7: Spring 2023 Percent Sensitive Taxa



	EDU BIOREF	BR 134.6	BR 122.2	BR 109.6	BR 102.5	BR 84.1	BR 58.4	BR 35.9	BR 6.2
>=9.0 Very Tolerant	2.3	4.3	9.3	5.1	17.8	5.1	4.8	2.3	5.0
7.5 - 8.9 Tolerant	20.9	9.2	16.7	22.5	21.6	4.8	4.1	5.9	6.3
5.0 - 7.4 Moderate	52.1	48.2	56.1	43.3	41.8	42.6	53.1	69.5	40.2
2.5 - 4.9 Intolerant	12.6	31.6	13.2	21.8	15.4	41.5	32.1	17.9	39.0
< 2.5 Very Intolerant	12.1	6.6	4.8	7.3	3.5	5.9	5.9	4.5	9.4

3.4.2 Macroinvertebrate Stream Condition Index (MSCI) Scores

Bourbeuse River fall 2022 samples tended to score well for TR, EPTT, BI, and SDI compared to BIOREF stations in the Ozark/Meramec EDU. Most Bourbeuse River stations sampled in fall 2022 had fully supporting MSCI scores (Table 8). The one exception was station #122.2, which attained a partially supporting score.

Table 8: Fall 2022 Bourbeuse River Riffle/Pool Metric Values and Scores Using Ozark/Meramec Biological Criteria

Stations	TR	EPTT	BI	SDI	MSCI	Support
BR 134.6	100 (5)	25 (5)	6.2 (3)	3.66 (5)	18	**F**
BR 122.2	85 (5)	20 (3)	5.9 (3)	2.65 (3)	14	**P**
BR 109.6	95 (5)	33 (5)	5.5 (5)	3.42 (5)	20	**F**
BR 102.5	88 (5)	27 (5)	5.4 (5)	3.41 (5)	20	**F**
BR 84.1	95 (5)	33 (5)	5.3 (5)	3.34 (5)	20	**F**
BR 72.9	76 (3)	28 (5)	6.1 (3)	3.31 (5)	16	**F**
BR 58.4	85 (5)	27 (5)	5.7 (3)	3.26 (5)	18	**F**
BR 35.9	86 (5)	31 (5)	5.3 (5)	3.03 (3)	18	**F**
BR 16.2	88 (5)	31 (5)	5.3 (5)	2.85 (3)	18	**F**
BR 6.2	101 (5)	33 (5)	5.7 (3)	3.32 (5)	18	**F**
Metric Score=5	>80	>23	<5.6	>3.13	20-16	**F**ull
Metric Score=3	80-40	23-11	5.6-7.8	3.13-1.57	14-10	**P**artial
Metric Score=1	<40	<11	>7.8	<1.57	8-4	**N**on

Sampling from 9/26/2022 to 9/29/2022. MSCI Scoring Table (in light gray) developed from BIOREF samples (n = 10). TR = Taxa Richness; EPTT = Ephemeroptera, Plecoptera, Trichoptera Taxa; BI = Biotic Index; SDI = Shannon Diversity Index; (#) superscript indicates individual metric scores.

In spring 2023 Bourbeuse River samples, stations #134.6, 122.2, 109.6, 84.1, and 35.9 attained fully supporting MSCI scores, and stations #102.5, 58.4, and 6.2 had partially supporting scores (Table 9). Stations #72.9 and 16.2 were not sampled due to high water levels that resulted in riffle habitat being completely pooled at these sites. We observed that much of the lower Bourbeuse River became one continuous pool due to higher spring water levels, low gradient, and impoundments. Despite the below average spring flow in spring 2023, the water level was still high enough to prevent sampling at stations #72.9 and 16.2.

Table 9: Spring 2023 Bourbeuse River Riffle/Pool Metric Values and Scores Using Ozark/Meramec Biological Criteria

Stations	TR	EPTT	BI	SDI	MSCI	Support
BR 134.6	94 (5)	26 (3)	6.6 (3)	3.69 (5)	16	**F**
BR 122.2	131 (5)	38 (5)	5.7 (5)	4.02 (5)	20	**F**
BR 109.6	115 (5)	33 (5)	6.1 (3)	3.61 (5)	18	**F**
BR 102.5	88 (3)	23 (3)	5.3 (5)	3.21 (3)	14	**P**
BR 84.1	106 (5)	34 (5)	5.1 (5)	3.08 (3)	18	**F**
BR 72.9						
BR 58.4	89 (3)	21 (3)	5.3 (5)	2.85 (3)	14	**P**
BR 35.9	101 (5)	27 (3)	5.2 (5)	2.99 (3)	16	**F**
BR 16.2						
BR 6.2	88 (3)	23 (3)	5.6 (5)	3.01 (3)	14	**P**
Metric Score=5	>93	>31	<5.9	>3.33	20-16	**F**ull
Metric Score=3	93-47	31-15	5.9-7.9	3.33-1.67	14-10	**P**artial
Metric Score=1	<47	<15	>7.9	<1.67	8-4	**N**on

Sampling from 3/13/20213 to 4/14/2023. MSCI Scoring Table (in light gray) developed from BIOREF samples (*n* = 14). TR = Taxa Richness; EPTT = Ephemeroptera, Plecoptera, Trichoptera Taxa; BI = Biotic Index; SDI = Shannon Diversity Index; (#) superscript indicates individual metric scores.

3.5 Duplicate Sample Results

A duplicate physicochemical sample was collected at Bourbeuse River station #58.4 during fall 2022 and at Bourbeuse River station #109.6 during spring 2023. The quality assurance criterion for duplicate sample results is expressed as relative percent difference as specified in the Fiscal Year 2023 Quality Assurance Project Plan (MoDNR 2022a). All duplicate sample results for this study met the required QA criterion.

4.0 Discussion

4.1 Land Use

Nonpoint source pollution from agricultural land use, including pasture, directly influences local habitat and biological diversity of streams (Allan 2004). In the Bourbeuse River watershed, pasture accounted for a notable portion of the total land use (Figure 3). Cattle pastures can cause an increase of bacteria concentrations (e.g. *E. coli*), total nitrogen, total phosphorus, total suspended sediments, and turbidity (Carpenter et al. 1998; James et al. 2007; Scott et al. 2017; Vidon et al. 2008). Sediment introduced into the stream channel may lead to a reduction in benthic stream species as interstitial habitat is reduced (Allan 2004). Nutrient enrichment from agricultural land use may increase algae growth and consequently decrease dissolved oxygen (Allan 2004), resulting in more tolerant taxa occupying the stream (Lenat and Crawford 1994).

The Bourbeuse River watershed contains several small municipalities along Highway 50 and Interstate 44. Although land use is primarily deciduous forests and hay/pasture fields containing little developed area (Figure 3), sites #16.2 and #6.2 are near urban areas associated with Union, Missouri (Figure 2). In the past, Union has experienced significant flooding events around the Bourbeuse River (Holmes 2016). Water resources affected by urbanization may experience increased volume of runoff and reduced infiltration (Tang et al. 2005; Walsh et al. 2005). Storm water and urban flooding events contribute to nonpoint source pollution (Allan 2004; Carle et al. 2005; Paul and Meyer 2001). Streams in urban areas tend to have increased concentrations of nutrients and contaminants as well as macroinvertebrate communities with reduced biotic richness and increased dominance of tolerant taxa (Allan 2004; Paul and Meyer 2001; Walsh et al. 2005).

4.2 Stream Habitat

Instream habitat and surrounding catchment variables influence aquatic community composition (Wang et al. 2007; Burdon et al. 2013). The Bourbeuse River can be characterized by its long, meandering pools connected by short riffle habitat. The scarcity of riffle habitat limited site selection for the study, although riffle habitat had excellent epifaunal substrate when present (Table 3). During the higher spring flows, riffle habitat disappeared or was greatly diminished due to higher water levels. Riffle habitat that had been sampled in the fall was completely submerged under several feet of water in the spring, and most reaches became exclusively unwadeable pool habitat. Spring samples were only possible due to lower-than-average flows, apart from station #72.9 and 16.2, which were not sampled due to a complete lack of available riffle habitat. The long pools often were filled with particulate matter and debris, contributing to high sedimentation at many stations (Table 3). High stream banks had sparse vegetation, but they appeared to be relatively stable (Table 3).

4.3 Physicochemical Analysis

All physicochemical analytical results from Bourbeuse River sampling stations were in compliance with Missouri WQS during fall 2022 and spring 2023 (MoDNR 2022f). Using EPA's recommended stream and river nutrient parameters (USEPA 2000), all Bourbeuse River stations exceeded EPA's recommended total phosphorus concentration in fall 2022 and spring 2023 (Table 4 and 5). The fall sample at station #6.2 and spring samples at stations #134.6, 122.2, and 109.6 exceeded EPA's recommendations for $NO_3 + NO_2$. Additionally, spring samples at stations #134.6, 122.2, 109.6, and 84.1 exceeded EPA's recommended value for total nitrogen (Table 5). Excessive nutrients can potentially threaten aquatic communities by causing algal blooms and eutrophication. High levels of nutrients can result in degraded aquatic communities (Dodds et al. 2009; Waite and Van Metre 2017; Wang et al. 2007). Excessive nutrients have been identified as a major reason why water quality objectives, such as support of aquatic life, fail (USEPA 2000).

4.4 Biological Assessment and Macroinvertebrate Community Composition

When comparing sample stations to BIOREF samples in the Ozark/Meramec EDU, most Bourbeuse River stations scored well for TR, EPTT, BI, and SDI (Table 8 and 9). All Bourbeuse River fall samples attained fully supporting MSCI scores, with the exception of station #122.2. Spring samples generally had lower scores, with more stations having partially supporting MSCI scores (i.e. stations #102.5, 58.4, and 6.2). Spring samples had much lower percentages of Ephemeroptera compared to BIOREF stations. Additionally, intolerant taxa (i.e. BI 5.0 - 7.4) were more abundant in spring samples compared to the previous fall samples (Figure 5 and 7).

Urban areas and WWTPs often contribute to declines in aquatic communities and biotic integrity (Dyer and Wang 2002). Commonly, declines in EPT abundance and richness are linked to urbanization and point source pollution near sample sites (Poulton and Tao 2020). Lenat and Crawford (1994) found that streams in urban settings suffer from low taxa richness, low abundance, and high BI values. Runoff from impervious surfaces and point source discharges introduce contaminants and excess nutrient influxes into waterways (Carpenter et al. 1998), causing taxa richness declines in aquatic communities (Paul and Meyer 2001). Furthermore, low Plecoptera, Trichoptera, and Gastropoda abundance are commonly seen in areas downstream from WWTPs (Enns et al. 2023). Not only can macroinvertebrate communities differ relative to their proximity to WWTPs, but seasonal differences can be observed downstream from WWTP outfalls, such as a decline in family diversity during winter (Aristone et al. 2022). Macroinvertebrate abundance tends to increase while diversity decreases downstream of large WWTPs (i.e. populations ~480,000); in contrast, small WWTPs (i.e. populations ~ 30,000) may lower macroinvertebrate abundance while increasing diversity (Aristone et al. 2022).

These observations may account for some seasonal difference in Bourbeuse River MSCI scores.

Two of the Bourbeuse River stations, #58.4 and 6.2, are located below instream impoundments. Although these stations attained fully supporting MSCI scores in fall 2022, they were partially supporting in spring 2023. MSCI scores were higher in uninterrupted reaches compared to impounded river areas, similar to the Fox River in Illinois (Santucci et al. 2005). Often physicochemical properties are unaffected by small reservoirs; however, macroinvertebrate scores may be affected, with less abundance of shredders and gatherer collectors (Martínez et al. 2013; Tiemann et al. 2004) as transport of leaves and other organic materials is halted. Differences in community composition may occur due to impoundments reducing flow upstream and increasing flow downstream (Tiemann et al. 2004). Additionally, dams may exacerbate natural low flow events causing macroinvertebrate community changes (Dewson et al. 2007). Swift water downstream from a dam can scour substrate and dislodge macroinvertebrates, thus affecting community composition.

Specialist FFG categories have specific feeding needs that may be limited in impaired systems, whereas generalist FFGs are thought to be more tolerant due their ability to use a wider array of available food resources. Many sites with lower MSCI scores in fall 2022 and spring 2023 had high percentages of the generalist FFGs filterer-collectors and gatherer-collectors (Figure 4 and 6). Because FFGs respond to anthropogenic inputs, stressed aquatic conditions are often manifested in FFG categories. Generalist categories, such as gatherer-collectors and filterer-collectors, increase in response to increased pollution, or disturbances, whereas specialists such as scrapers decrease (Barbour et al. 1999; Poulton et al. 2015).

5.0 Conclusions

Nonpoint source pollution input associated with agricultural land use practices coupled with urban municipal WWTPs have been identified as significant stressors to overall stream health (Allan 2004; Dyer and Wang 2002). The Bourbeuse River watershed is primarily deciduous forests and hay/pasture fields. The watershed also contains several WWTPs along Highway 50 and Interstate 44, which contribute effluent from several permitted outfalls. No Missouri WQS were violated, but nutrient levels were above EPA's recommended values at numerous sampling locations (MoDNR 2022f; USEPA 2000). Two historic mill dams on the Bourbeuse River resulted in increased pool habitat and may alter surrounding macroinvertebrate communities.

Despite these stressors, all but one Bourbeuse River fall samples attained fully supporting MSCI scores. Spring samples generally had lower scores, with some

sites being too inundated to sample. Although most spring 2023 sites were sampled, it was difficult to find diverse riffle habitat at several locations. It is quite possible that during normal spring high flows, there is little to no riffle habitat on the downstream Bourbeuse River.

Submitted by: 12/15/2025

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Appendix A
Macroinvertebrate Taxa Lists

Fall 2022 Macroinvertebrate Taxa Lists

* - large rare

Sep 26, 2022 Bourbeuse River - ab. & bl. Hwy. B [2034_134.6] - 22108			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	1	3	24
AMPHIPODA			
Hyalella azteca			89
BASOMMATOPHORA			
Ancylidae	3	3	1
Helisoma		1	1
Menetus		1	29
Physella	4	1	28
BRANCHIOBDELLIDA			
Branchiobdellida			1
COLEOPTERA			
Ancyronyx variegatus			1
Berosus			4
Dubiraphia		19	15
Ectopria nervosa	3		
Helichus lithophilus	1		4
Macronychus glabratus		1	3
Microcylloepus pusillus			2
Psephenus herricki	12	2	
Scirtidae			1
Stenelmis	21	9	1
DECAPODA			
Faxonius luteus	*	*	*
Faxonius punctimanus			*
DIPTERA			
Ablabesmyia		6	2
Anopheles			3
Ceratopogoninae	1	6	17
Chrysops	*		
Cladopelma		2	
Cladotanytarsus		1	
Clinotanypus			3
Corynoneura			2
Cricotopus bicinctus	7		
Cricotopus/Orthocladius	13	1	7
Cryptochironomus		3	
Cryptotendipes		2	
Culex			2
Dasyheleinae			16
Dicrotendipes		5	3
Empididae (undescribed)	1		
Forcipomyiinae	1		
Hexatoma	1	4	
Hybomitra	*		
Labrundinia			8
Larsia			1
Nanocladius			2
Neostempellina reissi		1	
Parachironomus			1
Paratanytarsus		3	21
Polypedilum flavum	32		
Polypedilum illinoense grp	2		7
Polypedilum trigonum	1		2
Procladius		4	
Pseudochironomus		2	4
Rheocricotopus			1
Rheotanytarsus	24		17
Simulium	1		
Stempellinella		2	2
Stictochironomus		7	
Tanytarsus	3	24	20
Thienemanniella	2	4	3

Thienemannimyia grp	1		2
EPHEMEROPTERA			
Acentrella	7		
Acerpenna	4		
Anthopotamus	4	29	
Baetis	12		2
Baetiscidae		1	
Caenis anceps	27	39	
Caenis latipennis	7	37	12
Choroterpes	1	10	2
Isonychia bicolor	9		
Leucrocuta	5		
Procloeon		2	1
Stenacron	4	1	
Stenonema femoratum		12	3
Stenonema pulchellum	15		
Stenonema terminatum	1		
Tricorythodes	200	2	3
HEMIPTERA			
Trepobates			1
LUMBRICINA			
Lumbricina	*	1	
MEGALOPTERA			
Corydalus	2		
NEOTAENIOGLOSSA			
Elimia	2	1	
ODONATA			
Argia	10	5	9
Enallagma			30
Gomphurus		1	
Hagenius brevistylus		*	
Hetaerina			1
Libellula			*
Macromia		*	*
Ophiogomphus	*		
Progomphus obscurus	*		
PLECOPTERA			
Neoperla	13	3	

TRICHOPTERA			
Cernotina			1
Cheumatopsyche	32		6
Chimarra	13		
Mystacides		3	1
Nectopsyche		2	
Oecetis	3		6
Oxyethira			4
Triaenodes			12
TUBIFICIDA			
Branchiura sowerbyi		3	1
Limnodrilus hoffmeisteri			1
Tubificinae		8	4
VENEROIDA			
Corbicula	13	19	1
Pisidiidae			1

Sep 26, 2022 Bourbeuse River - bl. Hwy EE [2034_122.2] - 22109			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	3	1	1
AMPHIPODA			
Hyalella azteca		2	9
ARCHITAENIOGLOSSA			
Campeloma		*	
BASOMMATOPHORA			
Ancylidae		1	1
Helisoma			*
Menetus		1	3
Physella		7	1
COLEOPTERA			
Berosus			4
Dineutus			14
Dubiraphia		11	11
Ectopria nervosa		2	
Helichus lithophilus			10
Macronychus glabratus			4
Stenelmis	127	56	1

DECAPODA			
Faxonius luteus	*		
DIPTERA			
Ablabesmyia		6	
Ceratopogoninae		2	
Cladopelma		1	
Clinotanypus			2
Cricotopus bicinctus			1
Cricotopus/Orthocladius	11	4	
Cryptochironomus		1	
Dicrotendipes		5	
Glyptotendipes	2		
Hexatoma	*		
Kribiodorum perpulchrum		1	
Labrundinia		1	1
Nanocladius	4		
Parachironomus	3		
Paratanytarsus		4	7
Polypedilum flavum	320	3	15
Polypedilum illinoense grp	2		9
Polypedilum scalaenum grp	2		
Procladius		1	
Pseudochironomus		2	
Rheotanytarsus	716	5	124
Simulium	8		
Stempellinella		3	
Stictochironomus		3	1
Tabanus	*		
Tanytarsus	1	11	5
Thienemanniella	2		
Thienemannimyia grp	12		1
EPHEMEROPTERA			
Anthopotamus		23	
Baetis	19		
Caenis anceps	2	18	5
Caenis latipennis	3	30	
Choroterpes		26	

Isonychia bicolor	5		
Procloeon		3	
Stenacron	8	24	
Stenonema femoratum		43	1
Stenonema pulchellum	7	1	
Tricorythodes	223	13	11
HEMIPTERA			
Metrobates			1
Rheumatobates			1
LEPIDOPTERA			
Petrophila	1		
LUMBRICINA			
Lumbricina	*	*	
MEGALOPTERA			
Corydalus	5		
Sialis		2	
NEOTAENIOGLOSSA			
Elimia			3
Hydrobiidae			1
ODONATA			
Argia		5	9
Basiaeschna janata			1
Calopteryx	1		1
Enallagma			23
Hagenius brevistylus		1	
Libellulidae		1	
Stylogomphus sigmastylus		*	
Stylurus		*	*
PLECOPTERA			
Neoperla	47	20	
TRICHOPTERA			
Cheumatopsyche	305	1	12
Chimarra	38		
Helicopsyche	1	4	6
Hydropsyche	64		11
Hydroptilidae	1		
Nectopsyche	8	6	
Oecetis	3	1	5

Plectrocnemia	3	1	
TRICLADIDA			
Planariidae	1	1	
TUBIFICIDA			
Branchiura sowerbyi	1	5	
Limnodrilus hoffmeisteri	2		
Tubificinae	8	10	
VENEROIDA			
Corbicula	2	7	1
Pisidiidae			4

Sep 29, 2022 Bourbeuse River - bl. Hog Trough Rd. [2034_109.6] - 22110			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	3	22	18
AMPHIPODA			
Hyalella azteca			42
BASOMMATOPHORA			
Ancylidae	2	2	
Helisoma	*		3
Lymnaeidae			1
Menetus			4
Physella		1	1
COLEOPTERA			
Ancyronyx variegatus		1	1
Dubiraphia		12	40
Optioservus sandersoni			1
Scirtidae			5
Stenelmis	123	26	2
DIPTERA			
Ablabesmyia		8	
Ceratopogoninae	2		2
Chironomidae		1	
Cladotanytarsus	1		
Corynoneura		1	
Cricotopus bicinctus	1		1
Cricotopus/Orthocladius	1	4	6
Cryptochironomus		2	

Cryptotendipes		1	
Dicrotendipes		13	1
Hexatoma	3	2	
Labrundinia		3	3
Nanocladius		1	
Nilothauma		1	
Paratanytarsus		14	10
Polypedilum flavum	34	1	
Polypedilum halterale grp		1	
Polypedilum illinoense grp		1	6
Potthastia		1	
Pseudochironomus		7	1
Rheotanytarsus	28	5	4
Simulium	1		
Stempellinella	1	17	1
Stenochironomus		1	1
Stictochironomus		7	
Tabanus	*		
Tanytarsus	2	29	13
Thienemanniella	3		
Thienemannimyia grp	1	1	
Tribelos		1	
EPHEMEROPTERA			
Acentrella	1		
Afghanurus	2		
Anafroptilum		2	
Anthopotamus	4		
Baetis	26		3
Baetisca lacustris	2	2	
Caenis anceps		14	
Caenis hilaris	3	6	1
Choroterpes		3	
Ephemera simulans		*	
Hexagenia limbata		1	
Isonychia rufa	1		
Leucrocuta	4		
Procloeon		1	

Stenacron	4	2	
Stenonema femoratum			1
Stenonema mediopunctatum	1		
Stenonema pulchellum	12	4	2
Tricorythodes	212	11	7
HEMIPTERA			
Pelocoris			*
Ranatra nigra			*
LEPIDOPTERA			
Crambidae			11
LUMBRICINA			
Lumbricina	2	1	
MEGALOPTERA			
Corydalus	4		
NEOTAENIOGLOSSA			
Elimia	3	2	6
Hydrobiidae		6	2
ODONATA			
Argia		1	3
Boyeria			*
Calopteryx	1		12
Dromogomphus		1	
Enallagma			13
Hagenius brevistylus		1	
Macromia		*	*
Perithemis			*
Progomphus obscurus	*		
PLECOPTERA			
Agnetina flavescens	6	*	
Neoperla	44	9	
Perlinella ephyre		*	
TRICHOPTERA			
Cernotina		1	1
Cheumatopsyche	62		
Chimarra	60		2
Glossosomatidae	3		
Helicopsyche	6	1	
Hydroptila		6	4
Mystacides		7	1
Nectopsyche	1	9	3
Oecetis	14	14	2
Oxyethira			7
Triaenodes		*	11
TUBIFICIDA			
Aulodrilus		2	1
Branchiura sowerbyi		2	
Tubificinae		2	2
VENEROIDA			
Corbicula	12	8	

Sep 27, 2022 Bourbeuse River - bl. Hwy T [2034_102.5] - 22111			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	2	7	17
AMPHIPODA			
Hyalella azteca			26
BASOMMATOPHORA			
Ancylidae		5	3
Helisoma		*	1
Lymnaeidae			1
Menetus			2
BRANCHIOBDELLIDA			
Branchiobdellida	1		
COLEOPTERA			
Ancyronyx variegatus			1
Berosus		1	1
Dubiraphia		17	33
Ectopria nervosa			1
Helichus lithophilus			5
Macronychus glabratus			7
Microcylloepus pusillus			2
Scirtidae			4
Stenelmis	103	15	10
DECAPODA			
Faxonius luteus	*		
DIPTERA			

Ablabesmyia		2	5
Ceratopogoninae		1	
Chironomidae		1	
Cladopelma		1	
Cricotopus/Orthocladius	18		29
Cryptochironomus		1	
Dicrotendipes		7	14
Hexatoma	*	2	
Labrundinia	1		1
Nanocladius	8		2
Paralauterborniella		4	
Paratanytarsus		2	18
Polypedilum flavum	21		1
Polypedilum illinoense grp		1	1
Pseudochironomus		4	3
Rheocricotopus	4		
Rheotanytarsus	86	2	7
Simulium	4		
Stempellinella	1	6	
Stictochironomus		1	
Tanytarsus	20	44	31
Thienemanniella	12	1	
Thienemannimyia grp	2	1	
EPHEMEROPTERA			
Acerpenna	1		
Anthopotamus		1	
Baetis	5		
Caenis latipennis	1	17	1
Choroterpes		4	
Ephemera simulans		*	
Isonychia	7		
Labiobaetis			2
Leucrocuta	2		
Neocloeon		2	
Stenacron		6	
Stenonema mediopunctatum	7		
Stenonema pulchellum	127		1

Stenonema terminatum	17		
Tricorythodes	89	2	6
HEMIPTERA			
Ranatra fusca			*
LEPIDOPTERA			
Parapoynx		*	
Petrophila	1		
LUMBRICINA			
Lumbricina	*		
MEGALOPTERA			
Corydalus	3		
Sialis		*	
NEOTAENIOGLOSSA			
Elimia	1	11	2
Hydrobiidae			2
ODONATA			
Argia	1	1	1
Enallagma			14
Gomphurus		*	
Hagenius brevistylus		*	
Libellulidae			1
Macromia		1	
Progomphus obscurus		*	
PLECOPTERA			
Agnetina flavescens	3		
Neoperla	47	8	
Perlesta	1		
Perlinella ephyre		1	
RHYNCHOBDELLIDA			
Glossiphoniidae			*
TRICHOPTERA			
Cheumatopsyche	50		2
Chimarra	13		
Helicopsyche	4	4	10
Hydroptilidae	2	5	
Nectopsyche		23	3
Oecetis	2	2	3
Oxyethira			1

Triaenodes		4	24
TUBIFICIDA			
Aulodrilus		2	1
Branchiura sowerbyi		1	
Ilyodrilus templetoni		1	
Tubificinae	6	14	2
VENEROIDA			
Corbicula	2	9	2

Sep 28, 2022 Bourbeuse River - bl. Mill Rock Rd. [2034 84.1] - 22112			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	5	16	7
AMPHIPODA			
Hyalella azteca		4	9
BASOMMATOPHORA			
Helisoma			2
Menetus	1		3
COLEOPTERA			
Berosus		1	2
Dineutus			*
Dubiraphia		8	20
Helichus lithophilus			13
Psephenus herricki	1		
Stenelmis	201	29	2
DECAPODA			
Faxonius luteus	*		*
Faxonius punctimanus			*
Faxonius virilis			*
DIPTERA			
Ablabesmyia	1	17	3
Ceratopogoninae		10	
Chironomidae		1	1
Chrysops		2	
Constempellina		1	
Cricotopus bicinctus			2
Cricotopus/Orthocladius	3	3	8
Cryptochironomus		8	
Cryptotendipes		1	
Dicrotendipes		23	2
Forcipomyiinae	1		
Hexatoma	4	1	
Labrundinia		1	10
Nanocladius	2		2
Nilothauma		1	
Parachironomus			1
Paratanytarsus			4
Polypedilum flavum	107	1	1
Polypedilum halterale grp	1	3	
Polypedilum illinoense grp		1	7
Pseudochironomus		7	
Rheotanytarsus	59		3
Simulium	7		
Stempellina		1	
Stempellinella	3	9	1
Stenochironomus			2
Stictochironomus		13	
Tabanus	*		
Tanytarsus	7	44	22
Thienemanniella		1	1
Thienemannimyia grp	2		
EPHEMEROPTERA			
Afghanurus	2		
Anthopotamus	8	4	
Apobaetis		1	
Baetis	15		
Baetisca lacustris		2	
Caenis anceps	2	1	
Caenis hilaris		8	
Caenis latipennis		1	3
Choroterpes		18	1
Ephemera simulans		*	
Hexagenia limbata		*	
Isonychia bicolor	1		
Isonychia rufa	13		

Leptophlebiidae		6	
Leucrocuta	3		
Paracloeodes		1	1
Procloeon		5	
Stenacron	2	3	
Stenonema femoratum		4	
Stenonema mediopunctatum	1		
Stenonema pulchellum	53		
Stenonema terminatum	5		1
Tricorythodes	148	3	2
LUMBRICINA			
Lumbricina		*	
MEGALOPTERA			
Corydalus	8		
Sialis		*	
NEOTAENIOGLOSSA			
Hydrobiidae		1	7
ODONATA			
Argia			10
Calopteryx			*
Enallagma		1	15
Epitheca (Epicordulia)			*
Gomphidae			1
Hagenius brevistylus		1	
Hetaerina			1
Macromia			*
Stylogomphus sigmastylus	*		
PLECOPTERA			
Agnetina flavescens	1		
Neoperla	94	1	1
TRICHOPTERA			
Cheumatopsyche	73		
Chimarra	54		
Hydropsyche	4		
Hydroptila	1	2	1
Nectopsyche		5	
Oecetis	11	5	5
Oxyethira		1	1
Triaenodes			40
TUBIFICIDA			
Aulodrilus		1	1
Branchiura sowerbyi		1	
Tubificinae		2	1
UNIONIDA			
Unionidae			*
VENEROIDA			
Corbicula	2	1	*

Sep 27, 2022 Bourbeuse River - bl. Laubinger Ford Rd. [2034_72.9] - 22113			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	5	11	16
AMPHIPODA			
Hyalella azteca			2
BASOMMATOPHORA			
Menetus		1	4
COLEOPTERA			
Berosus	1		1
Dubiraphia		3	8
Helichus lithophilus			9
Macronychus glabratus			3
Scirtidae			2
Stenelmis	88	41	
DIPTERA			
Ablabesmyia	3	2	12
Ceratopogoninae	1	1	3
Chironomidae	1	3	7
Chironomus		1	7
Clinotanypus			1
Corynoneura	2		
Cricotopus/Orthocladius	5	5	1
Cryptochironomus		2	
Dicrotendipes	1	19	4
Hemerodromia			1
Hexatoma	*	3	

Microtendipes	1		
Nanocladius	2		5
Nilotanypus		1	3
Parachironomus	1	3	9
Paratanytarsus	1	4	19
Polypedilum flavum	21		2
Polypedilum halterale grp			2
Polypedilum illinoense grp	5	1	16
Pseudochironomus		3	
Rheotanytarsus	43	3	22
Simulium	5		
Stempellinella		9	3
Tanytarsus	19	38	42
Thienemannimyia grp	2	2	1
Tribelos			1
Zavrelimyia			1
EPHEMEROPTERA			
Acerpenna	1		
Afghanurus	2	2	
Anthopotamus	3	17	
Baetis	7	3	
Baetisca lacustris	1	2	
Caenis anceps	3	8	1
Caenis hilaris	2	8	2
Choroterpes		16	
Ephemera simulans		*	
Isonychia rufa	16		1
Plauditus		1	
Procloeon		1	
Stenacron	189	17	1
Stenonema femoratum		9	
Stenonema pulchellum	44	6	1
Stenonema terminatum			1
Tricorythodes	1	22	9
MEGALOPTERA			
Corydalus	2		
Sialis		2	

NEOTAENIOGLOSSA			
Hydrobiidae			*
ODONATA			
Argia	*		6
Enallagma			6
Macromia		1	*
Phanogomphus			*
Stylurus		*	
PLECOPTERA			
Neoperla	4	5	
Perlinella drymo		*	
TRICHOPTERA			
Cheumatopsyche	78	1	8
Chimarra	11		
Helicopsyche	1		
Hydroptila	8	11	1
Nectopsyche		8	6
Oecetis	33	12	2
Oxyethira			2
Triaenodes			3
Wormaldia	2		
TUBIFICIDA			
Branchiura sowerbyi		2	
Tubificinae	1	2	2
UNIONIDA			
Unionidae		*	
VENEROIDA			
Corbicula	4	4	1

Sep 28, 2022 Bourbeuse River - ab. Hwy 185 [2034_58.4] - 22114			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	3	6	5
AMPHIPODA			
Hyalella azteca			13
BASOMMATOPHORA			
Ancylidae	1		3
Menetus	1		30

Physella			2
COLEOPTERA			
Ancyronyx variegatus			2
Berosus			4
Dubiraphia		12	14
Helichus lithophilus			2
Optioservus sandersoni			11
Stenelmis	98	19	1
DECAPODA			
Faxonius punctimanus			*
DIPTERA			
Ablabesmyia		14	10
Ceratopogoninae	1		1
Corynoneura	1	1	
Cricotopus/Orthocladius	19	3	20
Cryptochironomus		6	2
Cryptotendipes		1	
Culex			1
Dicrotendipes		28	8
Hemerodromia	1		
Hexatoma	1	*	
Labrundinia			10
Nanocladius			1
Parachironomus			3
Paratanytarsus		2	9
Phaenopsectra		3	1
Polypedilum flavum	144	2	20
Polypedilum halterale grp		1	
Polypedilum illinoense grp	2		3
Polypedilum scalaenum grp		5	
Pseudochironomus		1	4
Rheotanytarsus	21	1	15
Simulium	3		3
Stempellinella		4	
Tanypus			1
Tanytarsus	2	26	41
Thienemanniella	2		1

Thienemannimyia grp	2		2
Tribelos			1
Xestochironomus			1
EPHEMEROPTERA			
Anthopotamus	3	28	1
Baetis	19	1	1
Baetiscidae		4	
Caenis anceps	1	3	
Caenis hilaris	2	9	
Caenis latipennis			2
Choroterpes		15	
Isonychia rufa	29		3
Leucrocuta		2	
Stenacron	1		1
Stenonema femoratum		*	
Stenonema pulchellum	17	2	4
Tricorythodes	216	22	27
HEMIPTERA			
Trepobates			1
LUMBRICINA			
Lumbricina			1
MEGALOPTERA			
Corydalus	1		
NEOTAENIOGLOSSA			
Hydrobiidae			1
Pleurocera			*
ODONATA			
Argia	1	1	9
Calopteryx			3
Enallagma			28
Gomphidae		1	
Hagenius brevistylus		1	*
Hetaerina			5
Macromia			*
PLECOPTERA			
Neoperla	13		
Perlidae	1		
TRICHOPTERA			

Cernotina	1		
Cheumatopsyche	123	1	18
Chimarra	42		1
Helicopsyche	1		2
Hydropsyche	28		10
Hydropsychidae			1
Hydroptila	2	5	2
Nectopsyche		30	2
Ochrotrichia	2		
Oecetis	16	2	6
Oxyethira			2
Triaenodes		2	
TRICLADIDA			
Planariidae			3
TUBIFICIDA			
Branchiura sowerbyi		1	
Tubificinae		4	1
VENEROIDA			
Corbicula	4		
Pisidiidae			1

Sep 28, 2022 Bourbeuse River - bl. Reiker Ford Rd. [2034 35.9] - 22115			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	4	12	4
AMPHIPODA			
Hyalella azteca			8
ARCHITAENIOGLOSSA			
Campeloma			*
ARHYNCHOBDELLIDA			
Erpobdellidae			*
BASOMMATOPHORA			
Ancylidae	1		
Helisoma			2
Menetus			1
Physella			1
COLEOPTERA			
Berosus		1	1

Dubiraphia		4	46
Helichus lithophilus			8
Macronychus glabratus		1	2
Scirtidae			2
Stenelmis	189	43	
DIPTERA			
Ablabesmyia		4	7
Anopheles			2
Ceratopogoninae	2	3	1
Chironomidae	2		1
Chironomus		20	
Cladotanytarsus	1	2	
Corynoneura			3
Cricotopus/Orthocladius	24	2	2
Cryptochironomus		2	1
Dicrotendipes	1	19	3
Hemerodromia		1	1
Hexatoma	2	*	
Labrundinia		2	5
Nanocladius		2	
Parachironomus			3
Paracladopelma		2	
Paralauterborniella		1	
Paratanytarsus		1	4
Polypedilum flavum	110	7	3
Polypedilum illinoense grp	1		6
Polypedilum scalaenum grp		2	
Procladius		1	
Rheotanytarsus	46	6	9
Simulium	15		
Stempellinella	1	5	3
Tabanus	*		
Tanytarsus	4	9	16
Thienemanniella	3		
Thienemannimyia grp		1	1
Tvetenia tshernovskii	2		
EPHEMEROPTERA			

Afghanurus		2	
Anthopotamus	32	8	
Baetis	26	1	
Baetisca lacustris	2	7	
Caenis anceps	1	1	
Caenis hilaris	1	12	
Choroterpes		4	
Hexagenia limbata			1
Isonychia bicolor	1		
Isonychia rufa	17	2	4
Labiobaetis			1
Leptophlebiidae		2	
Plauditus		2	
Stenacron		1	
Stenonema pulchellum	40	5	3
Stenonema terminatum	2		1
Tricorythodes	215	41	46
HEMIPTERA			
Trepobates			2
LUMBRICINA			
Lumbricina	3		
MEGALOPTERA			
Corydalus	*		
NEOTAENIOGLOSSA			
Hydrobiidae			7
Pleurocera			1
ODONATA			
Argia			2
Enallagma			12
Hetaerina			3
PLECOPTERA			
Agnetina flavescens	6		
Neoperla	40	6	
Perlinella ephyre		1	
TRICHOPTERA			
Cernotina			1
Cheumatopsyche	268	8	10
Chimarra	197	1	3
Glossosomatidae	3		
Helicopsyche	1		1
Hydropsyche	10		
Hydroptila	10	2	
Nectopsyche		22	
Oecetis	7	7	20
Oxyethira			1
Triaenodes			2
TRICLADIDA			
Planariidae	1		1
TUBIFICIDA			
Tubificinae	1	2	1
VENEROIDA			
Corbicula	1	4	*

Sep 29, 2022 Bourbeuse River - ab. Hwy 50 @ Union Access [2034 16.2] - 22116			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	5	11	19
AMPHIPODA			
Hyalella azteca			4
ARCHITAENIOGLOSSA			
Campeloma			*
BASOMMATOPHORA			
Ancylidae		1	1
Menetus		1	35
Physella	1	2	1
BRANCHIOBDELLIDA			
Branchiobdellida		1	
COLEOPTERA			
Ancyronyx variegatus			3
Berosus	1	1	
Dubiraphia		5	31
Helichus lithophilus			7
Macronychus glabratus			15
Scirtidae			4
Stenelmis	158	40	8
DECAPODA			

Faxonius luteus			*
Faxonius punctimanus			*
DIPTERA			
Ablabesmyia		8	7
Ceratopogoninae	3	3	1
Chironomus		1	
Clinotanypus			3
Corynoneura	1		1
Cricotopus bicinctus	5	3	1
Cricotopus/Orthocladius	3	1	3
Cryptochironomus	1	3	
Dicrotendipes		11	4
Hexatoma	2	1	
Labrundinia			16
Nanocladius		1	
Paralauterborniella		7	
Polypedilum flavum	4		
Polypedilum halterale grp		1	
Polypedilum illinoense grp			6
Procladius		1	
Pseudochironomus	1	7	
Stempellina		5	
Stempellinella	3	5	
Tanytarsus	5	20	12
Thienemanniella	1	2	1
Tribelos	1	1	
EPHEMEROPTERA			
Acentrella	4		
Acerpenna	15	2	
Afghanurus	1		
Anthopotamus	10	9	
Baetis	35		
Baetisca lacustris	2		
Caenis hilaris	2	3	
Caenis latipennis			2
Choroterpes	1	13	
Hexagenia limbata		*	*

Isonychia bicolor	13		
Isonychia rufa	3		
Leucrocuta	3	2	
Plauditus		1	
Procloeon		3	
Stenacron		2	1
Stenonema femoratum			1
Stenonema pulchellum	52	11	5
Stenonema terminatum	1		2
Tricorythodes	529	18	13
MEGALOPTERA			
Corydalus	1		
NEOTAENIOGLOSSA			
Elimia	8	9	
Hydrobiidae			10
Pleurocera	1	2	*
ODONATA			
Argia	*	3	30
Arigomphus		*	
Enallagma			10
Epitheca (Tetragoneuria)			*
Erpetogomphus	1		
Gomphurus		*	
Hetaerina			12
Macromia		1	
PLECOPTERA			
Neoperla	38	15	
Perlinella ephyre		3	
TRICHOPTERA			
Cheumatopsyche	23		
Chimarra	12		
Helicopsyche	1		1
Hydropsyche morosa grp	12		
Hydroptila		3	
Mystacides		3	
Oecetis	11	9	3
Oxyethira			2
Triaenodes			3

TRICLADIDA			
Planariidae	1		
TUBIFICIDA			
Aulodrilus	1		
Branchiura sowerbyi		1	1
Tubificinae	1	1	
UNIONIDA			
Unionidae	*		
VENEROIDA			
Corbicula	7	4	2

Sep 29, 2022 Bourbeuse River - bl. Interstate 44 @ Uhlemeyer Access [2034_6.2] - 22117			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina		1	3
AMPHIPODA			
Hyalella azteca			9
ARHYNCHOBDELLIDA			
Erpobdellidae			*
BASOMMATOPHORA			
Ancylidae		3	
Menetus			19
Physella			7
COLEOPTERA			
Berosus		1	1
Dineutus			2
Dubiraphia		7	25
Helichus lithophilus			7
Macronychus glabratus			5
Scirtidae			1
Stenelmis	144	6	6
DIPTERA			
Ablabesmyia		12	7
Anopheles			1
Ceratopogoninae		7	
Chironomidae		2	1
Chironomus		31	
Cladopelma		6	

Cladotanytarsus	3	12	
Corynoneura	1		
Cricotopus bicinctus	2		1
Cricotopus/Orthocladius	3	1	3
Cryptochironomus		22	1
Cryptotendipes		3	
Dicrotendipes	1	16	2
Forcipomyiinae			1
Hemerodromia			1
Labrundinia		1	1
Nanocladius	1	1	1
Nilotanypus			1
Parachironomus	2	2	6
Paracladopelma		1	
Parakiefferiella		1	
Paralauterborniella		9	1
Polypedilum flavum	52	1	13
Polypedilum halterale grp		22	
Polypedilum illinoense grp		4	11
Polypedilum scalaenum grp		8	
Procladius		3	
Pseudochironomus		10	
Rheotanytarsus	30	2	11
Simulium	14		1
Stegopterna			2
Stempellina		2	
Stempellinella		2	
Tanytarsus	8	40	6
Telopelopia	1		
Thienemanniella	1	1	3
Thienemannimyia grp	2	12	3
Tribelos		1	
EPHEMEROPTERA			
Acentrella	1		
Anthopotamus	10	1	
Apobaetis		5	
Baetis	70		5

Caenis anceps		2	
Caenis hilaris	4	6	1
Caenis latipennis		1	1
Choroterpes		1	
Hexagenia limbata		*	
Isonychia bicolor	20		
Isonychia rufa	41		3
Labiobaetis	1		
Leucrocuta	*		
Plauditus	2		
Procloeon		2	
Stenacron	7	5	5
Stenonema femoratum	19	8	1
Stenonema pulchellum	38		4
Stenonema terminatum	1		5
Tricorythodes	290	7	56
HEMIPTERA			
Belostoma			*
MEGALOPTERA			
Corydalus	7		
NEOTAENIOGLOSSA			
Pleurocera	*		
ODONATA			
Argia		2	26
Basiaeschna janata			*
Calopteryx			8
Enallagma			15
Hetaerina			13
Macromia		1	
Stylurus		1	
PLECOPTERA			
Agnetina flavescens	1		
Neoperla	14		
RHYNCHOBDELLIDA			
Glossiphoniidae	1		
TRICHOPTERA			
Cernotina		1	
Cheumatopsyche	258		6
Chimarra	122	1	
Glossosomatidae	4	1	
Hydropsyche	16		7
Hydropsyche morosa grp	13		
Hydroptila	2		
Mystacides		1	
Oecetis	16		5
Orthotrichia		1	
Triaenodes		1	1
TRICLADIDA			
Planariidae		1	
TUBIFICIDA			
Branchiura sowerbyi		2	
Tubificinae		8	
UNIONIDA			
Unionidae			1
VENEROIDA			
Corbicula	*	1	
Pisidiidae			1

Spring 2023 Macroinvertebrate Taxa Lists

* - large rare

Mar 13, 2023 Bourbeuse River - ab. & bl. Hwy. B [2034_134.6] - 23051			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina		1	
AMPHIPODA			
Hyalella azteca			19
BASOMMATOPHORA			
Ancylidae	3	2	3
Helisoma			1
Lymnaeidae	2		1
Menetus	1		1
Physella	11	3	19
COLEOPTERA			
Ancyronyx variegatus			1

Berosus	1	1	2
Dubiraphia		3	1
Helichus fastigiatus			3
Paracymus	6	1	
Psephenus herricki	2	1	
Stenelmis	62	8	1
DECAPODA			
Faxonius luteus	1	*	*
DIPTERA			
Ablabesmyia		19	8
Ceratopogoninae	5	2	
Chironomidae		2	6
Cladotanytarsus		2	1
Corynoneura	1		
Cricotopus/Orthocladius	46	13	44
Cryptochironomus		1	
Dicrotendipes	1	15	1
Diplocladius	5	3	2
Ephydridae	1		
Eukiefferiella	47	3	6
Glyptotendipes			2
Hexatoma	5		
Hybomitra	*		
Hydrobaenus	23	8	5
Ormosia	5		
Orthocladius (Euorthocladius)	8	1	4
Parametriocnemus	7		
Paratanytarsus	1	13	19
Phaenopsectra		1	2
Polypedilum flavum	6		1
Polypedilum illinoense grp			2
Procladius		1	
Prosimulium	9		4
Pseudochironomus	3	4	1
Rheocricotopus	2		2
Rheotanytarsus	3	1	1
Simulium	8		8

Stempellinella	6	3	4
Stictochironomus	2	9	3
Tabanus		*	
Tanytarsus	5	16	11
Thienemanniella	1		1
Thienemannimyia grp	2	1	
Tipula		*	
Trichoclinocera	1		
Tvetenia bavarica grp	1		
EPHEMEROPTERA			
Acerpenna	1		9
Anthopotamus	2		
Caenis latipennis	23	22	10
Ephemera simulans		*	2
Eurylophella enoensis			1
Leptophlebia			5
Plauditus	1		
Procloeon			1
Stenacron		1	
Stenonema femoratum	18	5	15
Stenonema pulchellum	1		
Tricorythodes	16	1	2
ISOPODA			
Caecidotea	1		1
LUMBRICINA			
Lumbricina	20	5	1
NEOTAENIOGLOSSA			
Elimia	1		7
Hydrobiidae	2	1	
ODONATA			
Argia			2
Enallagma		2	7
Gomphidae		*	
Hagenius brevistylus		*	
PLECOPTERA			
Amphinemura	3		
Chloroperlidae	2		
Isoperla	3		1

Neoperla	20		
Perlinella drymo			1
Prostoia	3		2
RHYNCHOBDELLIDA			
Piscicolidae			1
TRICHOPTERA			
Cheumatopsyche	1		1
Chimarra	4		
Hydroptila	5		3
Oecetis			1
Ptilostomis			1
Pycnopsyche	*		3
Rhyacophila			1
Triaenodes		1	1
TRICLADIDA			
Planariidae	1		1
TUBIFICIDA			
Branchiura sowerbyi	2	1	2
Limnodrilus cervix	1		1
Limnodrilus hoffmeisteri	2	3	
Tubificinae	15	39	2
VENEROIDA			
Corbicula	19		2
Pisidiidae	1		

Mar 13, 2023 Bourbeuse River - bl. Hwy EE [2034_122.2] - 23052			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	1	16	3
AMPHIPODA			
Hyalella azteca	4		27
Stygobromus		1	
BASOMMATOPHORA			
Lymnaeidae	1	1	3
Menetus	2		1
Physella	1		
COLEOPTERA			
Ancyronyx variegatus		1	

Berosus	1	3	
Dineutus			*
Dubiraphia		2	3
Helichus lithophilus	1		3
Hydrophilidae			1
Macronychus glabratus		1	1
Optioservus sandersoni	1		
Psephenus herricki	1		
Scirtidae			4
Stenelmis	55	25	
DECAPODA			
Faxonius luteus	*		1
Faxonius punctimanus	1		
DIPTERA			
Ablabesmyia		14	2
Ceratopogoninae	1	5	2
Chironomidae	1	5	3
Chironomus		1	
Chrysops		2	
Cladotanytarsus		9	
Coelotanypus		1	
Corynoneura		2	2
Cricotopus bicinctus	7	2	9
Cricotopus trifascia	1		
Cricotopus/Orthocladius	63	8	24
Cryptochironomus		1	
Diamesa	1		
Dicrotendipes	1	10	1
Diplocladius	1	1	
Diptera	1	2	
Erioptera			1
Eukiefferiella	58	4	7
Glyptotendipes			1
Gonomyia	17	3	1
Hemerodromia	4		
Hexatoma		*	
Hydrobaenus	8	2	2
Labrundinia			11

Micropsectra			1
Microtendipes	1		
Nanocladius			3
Nilothauma			1
Orthocladius (Euorthocladius)	3		
Pagastiella		1	
Parakiefferiella		2	
Parametriocnemus	2		1
Paraphaenocladius	1		
Paratanytarsus	6	10	29
Paratendipes	1		
Phaenopsectra		1	
Polypedilum aviceps	3		
Polypedilum flavum	12	2	2
Polypedilum halterale grp		5	
Polypedilum illinoense grp			3
Prosimulium	45		1
Pseudochironomus	2	2	
Rheocricotopus	2		4
Rheotanytarsus	16	1	5
Simulium	21		9
Stempellinella	3	11	10
Stictochironomus		17	
Sympotthastia	2	1	
Tanytarsus	9	8	10
Telopelopia			1
Thienemanniella	1		2
Thienemannimyia grp	4		6
Tipula	7		
Trichoclinocera	7		
Tvetenia bavarica grp	1		
Zavrelimyia	1		
EPHEMEROPTERA			
Acentrella	3		
Acerpenna	5		1
Ameletus			1
Anthopotamus		3	

Baetisca lacustris		1	
Caenis anceps	5	7	5
Caenis latipennis	19	13	16
Eurylophella enoensis	1		2
Isonychia bicolor	5		1
Leptophlebia			2
Neocloeon			2
Stenacron		4	
Stenonema femoratum	25	9	3
Stenonema mediopunctatum	3		
Stenonema pulchellum	16		2
Stenonema terminatum	8		
Tricorythodes	12		3
ISOPODA			
Caecidotea			1
LUMBRICINA			
Lumbricina	1	1	
LUMBRICULIDA			
Lumbriculidae	2	2	
MEGALOPTERA			
Corydalus			1
NEOTAENIOGLOSSA			
Elimia			2
ODONATA			
Argia			*
Enallagma		1	16
Gomphidae	2	1	
Hagenius brevistylus			1
Macromia			1
Stylogomphus sigmastylus	*		
PLECOPTERA			
Acroneuria	1		
Agnetina	3		
Amphinemura	3		
Helopicus nalatus	1		
Isoperla	5		
Neoperla	32	11	

Perlesta	7		3
Prostoia	2		1
Strophopteryx fasciata	6		
TRICHOPTERA			
Cernotina			1
Cheumatopsyche	11		1
Chimarra	10	2	
Helicopsyche	1		
Hydropsyche	1	2	
Hydroptila	5	2	2
Limnephilidae	1		
Nectopsyche		2	
Oecetis	2		
Pycnopsyche		1	4
Rhyacophila	1		
Triaenodes	3	1	
TRICLADIDA			
Planariidae	6		
TUBIFICIDA			
Enchytraeidae			1
Limnodrilus claparedianus		1	
Limnodrilus hoffmeisteri	1	4	
Tubificinae	2	10	
VENEROIDA			
Corbicula	4		*
Pisidiidae	1		

Mar 14, 2023 Bourbeuse River - bl. Hog Trough Rd. [2034_109.6] - 23053			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	1		1
AMPHIPODA			
Hyalella azteca			26
BASOMMATOPHORA			
Ancylidae	1	1	1
Helisoma		*	1
Lymnaeidae	1	1	

Menetus		1	1
Physella	1	*	
COLEOPTERA			
Ancyronyx variegatus			1
Berosus	5		1
Dineutus			1
Dubiraphia	1	1	1
Helichus lithophilus			4
Hydrobius		1	1
Macronychus glabratus	3		3
Scirtidae			1
Stenelmis	183	3	1
DECAPODA			
Faxonius luteus		1	
DIPTERA			
Ablabesmyia		3	3
Ceratopogonidae	6	4	
Chrysops	1		
Cladotanytarsus	2	1	
Corynoneura	3		8
Cricotopus bicinctus	1		
Cricotopus trifascia	3		
Cricotopus/Orthocladius	14	38	98
Cryptochironomus	2	3	
Dicrotendipes	3	7	5
Diplocladius			2
Diptera			1
Empididae (undescribed)	1		
Erioptera		5	
Eukiefferiella	21	2	2
Gonomyia	5		
Hemerodromia	1		
Hexatoma	5	3	
Hydrobaenus	2	5	5
Labrundinia			10
Micropsectra			1
Parametriocnemus	5		1
Paraphaenocladius	1		

Paratanytarsus	2	7	49
Phaenopsectra		1	
Polypedilum fallax grp	1		
Polypedilum flavum	14	1	
Polypedilum illinoense grp			3
Polypedilum scalaenum grp	1		
Prosimulium	9		
Pseudochironomus	4	4	
Rheocricotopus	1		1
Rheotanytarsus	16	9	16
Simulium	8		2
Stempellinella	1	3	5
Stictochironomus	1	3	
Tanytarsus		26	20
Thienemanniella	1	1	2
Thienemannimyia grp	2	1	
Tipula	1		*
Tribelos		1	1
Trichoclinocera	1		
Tvetenia bavarica grp			1
Zavrelia		1	
EPHEMEROPTERA			
Acerpenna	1		2
Ameletus			1
Anthopotamus	1	2	
Baetisca lacustris		1	
Caenis anceps	9	7	1
Caenis hilaris	2		
Caenis latipennis	10	6	11
Eurylophella enoensis			3
Isonychia bicolor	3		3
Leptophlebia		1	1
Siphlonurus			1
Stenacron		1	1
Stenonema femoratum	1	7	2
Stenonema mediopunctatum	9		
Stenonema pulchellum	7	1	5

Tricorythodes	13	3	1
LEPIDOPTERA			
Noctuidae			2
LUMBRICINA			
Lumbricina	7	2	
NEOTAENIOGLOSSA			
Elimia	2	*	17
Hydrobiidae	2	2	1
ODONATA			
Argia			1
Basiaeschna janata			*
Dromogomphus			*
Enallagma			10
Epitheca (Epicordulia)			1
Gomphidae		*	
Hagenius brevistylus			1
Hetaerina			1
Macromia		*	
Phanogomphus		*	1
PLECOPTERA			
Agnetina flavescens	2		
Hydroperla crosbyi	1		*
Isoperla	2		1
Neoperla	12	1	
Perlesta	1	1	7
Prostoia			1
Strophopteryx fasciata	4		*
TRICHOPTERA			
Cheumatopsyche	9		
Chimarra	10	1	
Helicopsyche	5		
Hydropsyche	1		
Hydroptila	6	3	2
Nectopsyche	3		1
Polycentropodidae	1	1	
Ptilostomis			1
Pycnopsyche		*	*
Rhyacophila		*	

TUBIFICIDA			
Enchytraeidae	4	2	1
Limnodrilus hoffmeisteri	5	15	1
Limnodrilus udekemianus	1	1	
Tasserkidrilus superiorensis		2	
Tubificinae	10	24	
UNIONIDA			
Unionidae	1		
VENEROIDA			
Corbicula	6	3	

Apr 12, 2023 Bourbeuse River - bl. Hwy T [2034 102.5] - 23076			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	4	12	16
AMPHIPODA			
Hyalella azteca			9
ARCHITAENIOGLOSSA			
Campeloma	1		
BASOMMATOPHORA			
Ancylidae			2
Helisoma			1
BRANCHIOBDELLIDA			
Branchiobdellida		1	
COLEOPTERA			
Berosus		1	1
Dubiraphia	3	3	8
Helichus lithophilus		1	8
Macronychus glabratus			3
Optioservus sandersoni	2	1	1
Peltodytes			1
Stenelmis	92	7	3
DECAPODA			
Faxonius luteus			*
Faxonius punctimanus			1
DIPTERA			
Ablabesmyia		30	14
Ceratopogoninae		4	
Chironomidae			
Cladotanytarsus		3	
Corynoneura	2		4
Cricotopus/Orthocladius	25	6	29
Cryptochironomus		2	1
Cryptotendipes		2	
Dicrotendipes	1	6	4
Diptera		1	2
Eukiefferiella	32	2	
Hexatoma		1	
Hybomitra	*		
Labrundinia			10
Nanocladius		1	1
Paralauterborniella		3	
Paratanytarsus		5	12
Paratendipes		2	1
Pericomaini		1	
Polypedilum flavum	26	3	1
Polypedilum halterale grp		3	1
Polypedilum illinoense grp			18
Polypedilum scalaenum grp		3	1
Procladius		1	
Rheotanytarsus	10	2	6
Simulium	288	4	
Stempellinella	1	7	22
Stictochironomus		11	
Tanytarsus	5	37	66
Thienemanniella		2	5
Thienemannimyia grp	1		
Tipula	*		
Trichoclinocera	1		
Zavrelia		3	1
EPHEMEROPTERA			
Anthopotamus		*	
Baetisca lacustris		1	1
Caenis latipennis	6	8	11

Isonychia bicolor	2		
Leptophlebiidae			1
Plauditus	11		1
Stenacron		1	1
Stenonema femoratum			6
Stenonema pulchellum	4		
Stenonema terminatum	1		
Tricorythodes	38	3	3
LUMBRICINA			
Lumbricina	*	3	
LUMBRICULIDA			
Lumbriculidae	1	1	
MEGALOPTERA			
Corydalus	1		
NEOTAENIOGLOSSA			
Elimia	2	1	5
ODONATA			
Argia	*		*
Didymops			2
Enallagma	1		18
Gomphurus			*
Hagenius brevistylus		1	*
Macromia	1		*
Phanogomphus			*
PLECOPTERA			
Agnetina flavescens	*		
Isoperla	3		1
Neoperla	9	2	
Perlesta	32		8
TRICHOPTERA			
Cheumatopsyche	3	1	
Chimarra	4		
Helicopsyche	14	2	2
Hydroptila	17	4	1
Nectopsyche	1		5
Oecetis			1
Pycnopsyche			2
Triaenodes		5	5

TRICLADIDA			
Planariidae	1		
TUBIFICIDA			
Enchytraeidae		1	
Limnodrilus hoffmeisteri	1	3	
Tubificinae	2	4	
UNIONIDA			
Unionidae			*
VENEROIDA			
Corbicula	1	2	*

Apr 12, 2023 Bourbeuse River - bl. Mill Rock Rd. [2034_84.1] - 23077			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	4	20	1
AMPHIPODA			
Hyalella azteca			6
ARCHITAENIOGLOSSA			
Campeloma	1		
BASOMMATOPHORA			
Lymnaeidae	2	2	
BRANCHIOBDELLIDA			
Branchiobdellida			1
COLEOPTERA			
Dineutus		*	1
Dubiraphia	1	1	6
Helichus lithophilus			2
Peltodytes			2
Psephenus herricki		1	
Stenelmis	51	8	1
DECAPODA			
Cambaridae			*
Faxonius punctimanus	*		
DIPTERA			
Ablabesmyia		18	7
Ceratopogoninae	6	6	2
Chironomidae		1	
Cladotanytarsus	1	2	

Corynoneura		1	4
Cricotopus/Orthocladius	36	19	27
Cryptochironomus	1	6	
Demicryptochironomus	1	1	
Dicrotendipes		4	4
Diptera		8	
Ephydridae		1	
Eukiefferiella	44	2	4
Forcipomyiinae			1
Hemerodromia		1	
Hexatoma	1	*	
Hydrobaenus	1	8	
Labrundinia			3
Mesosmittia		1	
Nanocladius	1	1	
Ormosia	2	3	
Parakiefferiella			2
Paralauterborniella		5	
Paratanytarsus		2	5
Phaenopsectra		1	
Polypedilum flavum	19	3	19
Polypedilum halterale grp		5	
Polypedilum illinoense grp	4	2	6
Polypedilum scalaenum grp		3	
Pseudochironomus	2	1	
Rheotanytarsus	3		3
Robackia	2	1	
Simulium	265	6	159
Stempellinella	2	15	9
Stictochironomus		10	
Sympotthastia		1	
Tanytarsus	3	50	58
Telopelopia		4	
Thienemanniella	1	2	2
Thienemannimyia grp		1	2
Tipula	1		*
Tribelos	1		

EPHEMEROPTERA			
Acentrella	4		1
Acerpenna	5		
Anthopotamus		*	
Baetisca lacustris	1		
Caenis latipennis	6	8	22
Isonychia bicolor	3		
Leptophlebiidae		2	
Leucrocuta	3		
Plauditus	34	2	10
Serratella			1
Stenacron		3	
Stenonema femoratum	3	3	2
Stenonema terminatum	5	2	
Tricorythodes	12	6	4
HEMIPTERA			
Microvelia			1
MEGALOPTERA			
Corydalus	1		
ODONATA			
Argia			2
Arigomphus			*
Calopteryx			1
Enallagma			1
Hagenius brevistylus		*	
Hetaerina			1
Ischnura		1	5
Libellula			*
Macromia		1	
PLECOPTERA			
Agnetina flavescens	8		
Allocapnia		1	
Haploperla	1		
Hydroperla crosbyi	*		
Isoperla	8	1	1
Leuctra	1		
Neoperla	10	1	
Perlesta	59	6	20

TRICHOPTERA			
Cernotina		1	
Cheumatopsyche	2		2
Chimarra	2		1
Hydropsyche			*
Hydroptila	3		8
Ironoquia			*
Ithytrichia			1
Nectopsyche	1	1	3
Oecetis		2	
Pycnopsyche	*		*
Rhyacophila	1		
Triaenodes			2
TUBIFICIDA			
Branchiura sowerbyi		2	
Enchytraeidae		3	1
Limnodrilus cervix		1	
Limnodrilus hoffmeisteri	3	2	
Tubificinae	17	10	3
VENEROIDA			
Corbicula	1		
Pisidiidae	1	1	

Apr 14, 2023 Bourbeuse River - ab. Hwy 185 [2034_58.4] - 23078			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	3	6	
AMPHIPODA			
Gammarus			2
Hyalella azteca		1	6
COLEOPTERA			
Berosus			1
Dineutus			*
Dubiraphia	4	3	2
Helichus lithophilus			2
Heterosternuta		1	
Macronychus glabratus	1		1
Peltodytes		2	

Scirtidae			1
Stenelmis	182	106	
DECAPODA			
Faxonius luteus			*
DIPTERA			
Ablabesmyia		8	15
Ceratopogoninae		3	
Chironomidae		2	
Chironomus		1	
Cladopelma		1	
Cladotanytarsus		3	
Corynoneura		1	35
Cricotopus/Orthocladius	3	5	30
Cryptochironomus	1	1	
Cryptolabis		3	
Cryptotendipes		7	
Dicrotendipes		7	2
Diptera		4	1
Erioptera		6	
Eukiefferiella	10	2	
Hemerodromia	1		
Hexatoma	*	1	
Hydrobaenus		5	4
Labrundinia			2
Nanocladius	1		3
Nilotanypus			2
Parakiefferiella			1
Paralauterborniella		10	2
Paratanytarsus			2
Paratendipes		4	
Polypedilum flavum	14	2	2
Polypedilum halterale grp		1	1
Polypedilum illinoense grp		3	7
Polypedilum scalaenum grp		3	
Procladius		1	
Prosimulium	1		
Rheotanytarsus	1		1

Simulium	331	3	1
Stempellinella		17	19
Stictochironomus		14	
Tanytarsus		44	58
Telopelopia		2	1
Thienemanniella			2
Tipula			*
EPHEMEROPTERA			
Acerpenna		1	
Ameletus	2		
Anthopotamus		3	
Baetisca lacustris		2	*
Caenis latipennis		5	1
Plauditus	1		1
Stenonema pulchellum	15	4	1
Stenonema terminatum	5		
Tricorythodes	33	2	7
LUMBRICINA			
Lumbricina	*	1	
MEGALOPTERA			
Corydalus	3		
NEOTAENIOGLOSSA			
Hydrobiidae			2
Pleurocera		1	*
ODONATA			
Argia			2
Dromogomphus			*
Enallagma			1
Epitheca (Epicordulia)			*
Hagenius brevistylus			*
Hetaerina			*
Macromia		*	*
PLECOPTERA			
Agnetina flavescens	1		
Neoperla		2	
Perlesta	42		25
TRICHOPTERA			
Cheumatopsyche	9		
Chimarra	3		
Helicopsyche	3		1
Hydropsyche	1		
Hydroptila	6		2
Nectopsyche		4	4
Oecetis			1
Pycnopsyche			*
Triaenodes	1	2	4
TRICLADIDA			
Planariidae	1		
TUBIFICIDA			
Enchytraeidae	2		2
Limnodrilus hoffmeisteri	9	5	
Tubificinae	14	5	1
VENEROIDA			
Corbicula	12		

Apr 12, 2023 Bourbeuse River - bl. Reiker Ford Rd. [2034_35.9] - 23079			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	7	11	5
AMPHIPODA			
Gammarus			1
Hyalella azteca			10
ARCHITAENIOGLOSSA			
Campeloma			*
BASOMMATOPHORA			
Helisoma			*
COLEOPTERA			
Ancyronyx variegatus			1
Berosus			2
Dineutus			*
Dubiraphia		1	7
Helichus lithophilus			5
Macronychus glabratus		1	4
Stenelmis	86	16	8
DIPTERA			
Ablabesmyia		2	11

Ceratopogoninae	6	2	1
Cladotanytarsus	10	54	11
Corynoneura		2	3
Cricotopus/Orthocladius	41	18	21
Cryptotendipes		2	
Diamesa			1
Dicrotendipes		5	5
Diptera		2	
Eukiefferiella	12		
Gonomyia	1		
Hemerodromia	4	3	
Hexatoma	*	*	*
Hydrobaenus	1	2	
Labrundinia			3
Lopescladius			1
Microtendipes		2	
Nanocladius			1
Nilotanypus			1
Ormosia		1	
Parakiefferiella			1
Paralauterborniella		5	7
Parametriocnemus	2		
Paratanytarsus			1
Paratendipes		2	
Phaenopsectra		2	
Polypedilum flavum	45	1	9
Polypedilum halterale grp		3	1
Polypedilum illinoense grp			4
Polypedilum scalaenum grp	4	3	
Procladius		2	
Pseudochironomus		1	
Rheocricotopus	2		
Rheotanytarsus	5		1
Simulium	351	4	33
Stempellina		1	
Stempellinella	1	5	3
Stictochironomus		2	

Tabanus	1		
Tanytarsus	12	61	49
Thienemanniella	1	1	4
Thienemannimyia grp	2		7
Tipula	*		*
Tvetenia tshernovskii	3		
EPHEMEROPTERA			
Acentrella	1		
Acerpenna	1		
Anthopotamus	1	2	
Baetisca lacustris		1	
Caenis latipennis			1
Isonychia bicolor	7		
Plauditus	6		2
Stenonema pulchellum	11		
Stenonema terminatum	3	1	2
Tricorythodes	10	2	6
HEMIPTERA			
Ranatra			*
LUMBRICINA			
Lumbricina		1	
LUMBRICULIDA			
Lumbriculidae	5	1	2
MEGALOPTERA			
Corydalus	*		
NEOTAENIOGLOSSA			
Hydrobiidae			2
Pleurocera	*		*
ODONATA			
Argia			3
Calopteryx			*
Enallagma			6
Macromia			1
Phanogomphus			*
PLECOPTERA			
Agnetina flavescens	3		
Amphinemura	3		
Clioperla clio			*

Neoperla	9		
Perlesta	21		21
Perlinella drymo		*	
TRICHOPTERA			
Cheumatopsyche	3	1	*
Chimarra	5		
Helicopsyche	9		
Hydropsyche	1		
Hydroptila	1	1	3
Nectopsyche			1
Ochrotrichia		1	1
Oecetis	3	1	3
Protoptila	1		
Pycnopsyche			*
Triaenodes			6
TRICLADIDA			
Planariidae			2
TUBIFICIDA			
Branchiura sowerbyi	1		1
Enchytraeidae	1		4
Limnodrilus claparedianus			1
Limnodrilus hoffmeisteri	4	2	1
Tubificinae	8	19	8
VENEROIDA			
Corbicula	1		1

Apr 14, 2023 Bourbeuse River - bl. Interstate 44 @ Uhlemeyer Access [2034_6.2] - 23080			
ORDER: Observed Taxa	CS	NF	RM
"HYDRACARINA"			
Acarina	21	10	
AMPHIPODA			
Hyalella azteca			3
ARHYNCHOBDELLIDA			
Erpobdellidae	*		
BASOMMATOPHORA			
Ancylidae			1
Menetus		1	

Physella			1
COLEOPTERA			
Berosus		1	1
Macronychus glabratus			2
Stenelmis	172	23	1
DECAPODA			
Faxonius punctimanus			*
DIPTERA			
Ablabesmyia		3	26
Ceratopogoninae		3	2
Chironomidae	6	5	6
Chironomus	1		
Cladopelma		2	
Cladotanytarsus	3	14	2
Corynoneura			1
Cricotopus/Orthocladius	27	14	30
Cryptochironomus	3	5	2
Cryptotendipes		2	
Dicrotendipes	1	10	11
Diptera			3
Empididae (undescribed)		2	
Eukiefferiella	6		
Eukiefferiella devonica grp	1		
Hemerodromia	3		
Hexatoma	1	1	
Hydrobaenus			2
Labrundinia			5
Microtendipes		1	
Nanocladius	1		
Ormosia		2	
Paralauterborniella		4	10
Paratanytarsus		2	2
Polypedilum flavum	77	8	32
Polypedilum halterale grp		7	1
Polypedilum illinoense grp			5
Polypedilum scalaenum grp		3	

Procladius			1
Pseudochironomus	2	1	
Rheotanytarsus	1	2	6
Simulium	116		38
Stempellina		4	
Stempellinella	15	18	13
Stictochironomus		2	
Tanytarsus	33	93	157
Telopelopia			1
Thienemanniella			1
Thienemannimyia grp	4	2	14
Tipula	*		
Tvetenia	1		
EPHEMEROPTERA			
Acerpenna	3		
Anthopotamus	4		
Baetisca lacustris	1	*	
Caenis latipennis		2	3
Isonychia bicolor	7		1
Plauditus	2		
Stenacron		1	
Stenonema femoratum		1	1
Stenonema pulchellum	13	2	
Stenonema terminatum	4		*
Tricorythodes	42	12	6
LUMBRICINA			
Lumbricina	1	1	
MEGALOPTERA			
Corydalus	*		
NEOTAENIOGLOSSA			
Pleurocera	*		

ODONATA			
Argia			3
Arigomphus			*
Enallagma		1	3
Hetaerina			*
Macromia			1
PLECOPTERA			
Agnetina flavescens	8		
Isoperla	1		
Neoperla	8		
Perlesta	24		4
RHYNCHOBDELLIDA			
Glossiphoniidae			1
TRICHOPTERA			
Cernotina		1	
Cheumatopsyche	17		1
Chimarra	15		1
Hydropsyche	3	1	
Hydroptila	3	1	3
Oecetis	1	2	1
Pycnopsyche			*
Triaenodes			2
TRICLADIDA			
Planariidae	2		
TUBIFICIDA			
Branchiura sowerbyi		1	
Limnodrilus hoffmeisteri		1	
Tubificinae	5	9	
VENEROIDA			
Corbicula	1	1	

Appendix B

Fall and Spring BIOREF Stream Scores

Fall BIOREF Stream Scores for Ozark/Meramec					
Stream	Date	TR	EPTT	BI	SI
Huzzah Creek - ab. Crabtree Rd.	9/21/1999	87	20	5.7	3.12
Meramec River - bl. Hwy 19, nr. Short Bend	10/3/2000	78	22	5.9	2.68
Huzzah Creek - 0.1 mi. bl. Crabtree Rd.	10/3/2000	83	24	5.9	3.37
Huzzah Creek - 0.1 mi. bl. Crabtree Rd.	10/1/2001	82	28	5.2	3.31
Huzzah Creek - ab. Crabtree Rd.	10/1/2001	78	27	4.9	3.15
Meramec River - 0.2 mi. ab. Lost Creek	10/2/2001	86	28	5.3	3.05
Meramec River - bl. Hwy 19, nr. Short Bend	10/2/2001	79	19	5.2	3.15
Huzzah Creek - 1.1 mi. ab. Crabtree Rd.	9/26/2012	94	31	5.4	3.27
Huzzah Creek - 1.1 mi. ab. Crabtree Rd.	9/26/2012	95	30	5.2	3.55
Meramec River - bl. Hwy 19, nr. Short Bend	10/2/2012	83	30	5.2	3.36
Spring BIOREF Streams Scores for Ozark/Meramec					
Stream	Date	TR	EPTT	BI	SI
Huzzah Creek - ab. Crabtree Rd.	3/16/1999	95	35	4.9	3.47
Meramec River - bl. Hwy 19, nr. Short Bend	3/13/2000	108	33	6.1	3.57
Huzzah Creek - ab. Crabtree Rd.	3/14/2000	103	36	5.6	3.44
Huzzah Creek - ab. Crabtree Rd.	3/27/2001	83	28	4.8	3.18
Meramec River - bl. Hwy 19, nr. Short Bend	3/27/2001	93	27	5.7	3.32
Meramec River - bl. Hwy 19, nr. Short Bend	3/27/2001	92	32	5.8	3.34
Huzzah Creek - 1.1 mi. ab. Crabtree Rd.	3/28/2013	110	33	5.5	3.46
Meramec River - bl. Hwy 19, nr. Short Bend	3/28/2013	113	38	6.2	3.54

TR = Taxa Richness; EPTT = Ephemeroptera, Plecoptera, Trichoptera Taxa; BI = Biotic Index; SDI = Shannon Diversity Index.